THE YEAR-BOOK

FOR

COLORISTS & DYERS

PRESENTING A REVIEW OF THE YEAR'S ADVANCES IN THE BLEACHING, DYEING, PRINTING, AND FINISHING OF TEXTILES

BY

HERMAN A. METZ

VOLUME X

NEW YORK
1907

PREFACE

This present is the tenth volume of this hand-book which has appeared. It covers, in a limited way, the novelties of the year, and the author trusts it will add to the general knowledge of the subjects treated.

HERMAN A. METZ

122 HUDSON ST., NEW YORK CITY, March, 1908.

CONTENTS

PART I

Reference Tables

Reference Tables

THE METRIC SYSTEM, WITH EQUIVALENTS.

The entire metric system of weights and measures is based upon a fundamental unit called a meter, which is the ten-millionth part of the distance from the equator to the pole, and is the principal unit of linear measure.

The ARE, or unit of square measure, is a square whose side is 10 meters.

The STERE, or unit of cubic measure, is a cube whose edge is a meter.

The LITER, or unit of all measures of capacity, is a cube whose edge is the tenth of a meter.

The GRAM or unit of weight, is the weight of a cube of pure water at its greatest density, the edge of which is the hundredth part of a meter.

Elements of the System.

Length.	Surface.	Capacity.	Weight.	Notation.
			Metric ton.	1,000,000
			Quintal.	100,000
Myriameter.			Myriagram.	10,000
Kilometer.		Kiloliter.	Kilogram.	1,000
Hectometer.	Hectare.	Hectoliter.	Hectogram.	100
Decameter.	Decare.	Decaliter.	Decagram.	10
Meter.	*Are.*	*Liter.*	*Gram.*	1
Decimeter.		Deciliter.	Decigram.	.1
Centimeter.	Centiare.	Centiliter.	Centigram.	.01
Millimeter.		Milliliter.	Milligram.	.001

Linear, or Long Measure.

	Meters.	Inches.	Feet.	Yards.	Miles.
Millimeter	.001	.03937	.00328	.00109	....
Centimeter	.01	.3937	.03280	.01093	....
Decimeter	.1	3.937	.32808	.10936	.00006
Meter	1	[1] 39.37	3.28083	1.093611	.00062
Decameter	10	....	32.80833	10.93611	.00621
Hectometer	100	....	328.0833	109.3611	.06213
Kilometer	1,000	....	3280.833	1093.611	.62137
Myriameter	10,000	....	....	....	6.2137

[1] 39.37 inches is the legalized equivalent of the meter in the United States. The exact equivalent is 39.37079 inches.

Square Measure.

	Square Meters.	Square Inches.	Square Feet.	Square Yards.	Acres.
Milliare	.1	155	1.0764	.1196	....
Centiare, or square meter	1	1550	10.764	1.196	....
Deciare	10	....	107.64	11.96	.0024
Are, or square decameter	100	....	1076.4	119.6	.0247
Decare	1,000	....	....	1196	.2471
Hectare	10,000	....	....	....	2.471

A square centimeter equals 0.155 square inches, a square decimeter 15.5 square inches, and a square kilometer 0.386 square miles.

Cubic Measure.

	Cubic Meters.	Cubic Inches.	Cubic Feet.	Cubic Yards.
Millistere, or cubic decimeter	.001	61.023	.035314	....
Centistere	.01	610.23	.35314	.01308
Decistere	.1	....	3.5314	.1308
Stere, or cubic meter	1	....	35.314	1.308
Decastere	10	....	353.14	13.08
Hectostere	100	....	....	130.8

Measure of Capacity.

	Liters.	Fluid Ounces.	Quarts.	Gallons.	Bushels.
Milliliter, or cubic centimeter	.001	.0338	.00106	....	....
Centiliter	.01	.338	.01057	.00264	....
Deciliter	.1	3.38	.10567	.02642	.002838
Liter, or cubic decimeter	1	33.8	1.0567	.26417	.028377
Decaliter	10	338	10.567	2.6417	.283774
Hectoliter	100	....	105.67	26.417	2.83774
Kiloliter	1,000	....	....	264.17	28.3774
Myrialiter	10,000	....	....	2641.7	283.774

A liter of water at its maximum density weighs a kilogram.

Weight.

	Grams.	Grains.	Ounces Avoirdupois.	Pounds Avoirdupois.	Tons of 2240 Pounds.
Milligram	.001	.01543	....	....	....
Centigram	.01	.15432	....	....	....
Decigram	.1	1.54324	.0035	....	....
Gram	1	15.43236	.0353	.0022	....
Decagram	10	154.32356	.3527	.0220	....
Hectogram	100	1,543.23564	3.5274	.22046	....
Kilogram	1,000	15,432.35639	35.274	2.20462	.000984
Myriagram	10,000	....	....	22.0462	.009842
Quintal	100,000	....	....	220.462	.09842
Millier, or tonneau	1,000,000	....	....	2204.62	.9842

COMPARISON OF METRIC SYSTEM WITH THE UNITED STATES METHOD OF WEIGHTS AND MEASURES.

(Arranged in Alphabetical Order.)

Are (100 square meters) = 119.6 square yards.

Bushel = 2150.42 cubic inches, 35.24 liters.

Centare (1 square meter) = 1550 square inches.

Centigram (1/100 gram) = 0.1543 grain.

Centiliter (1/100 liter) = 2.71 fluid drams, 0.338 fluid ounce.
Centimeter (1/100 meter) = 0.3937 inch.
1 Cubic centimeter = 16.23 minims (Apothecaries).
10 Cubic centimeters = 2.71 fluid drams (Apothecaries).
30 Cubic centimeters = 1.01 fluid ounces (Apothecaries).
100 Cubic centimeters = 3.38 fluid ounces (Apothecaries).
473 Cubic centimeters = 16.00 fluid ounces (Apothecaries).
500 Cubic centimeters = 16.90 fluid ounces (Apothecaries).
1000 Cubic centimeters = 33.81 fluid ounces (Apothecaries).
Decigram (1/10 gram) = 1.5432 grains.
Decimeter (1/10 meter) = 3.937 inches.
Deciliter (1/10 liter) = 0.845 gill.
Dekagram (10 grams) = 0.3527 ounce.
Dekaliter (10 liters) = 9.08 quarts (dry), 2.6418 gallons.
Dekameter (10 meters) = 393.7 inches.
Dram (Apothecaries or Troy) = 3.9 grams.
Foot = 0.3048 meter, or 30.48 centimeters.
Gallon = 3.785 liters.
Gill = 0.118295 liter, or 142 cubic centimeters.
Grain (Troy) = 0.064804 gram.
Grain = 0.0648.
Gram = 15.432 grains.
Hectare (10,000 square meters) = 2.471 acres.
Hectogram = 3.5274 ounces.
Hectoliter (100 liters) = 2.838 bushels, or 26.418 gallons.
Hectometer (100 meters) = 328 feet 1 inch.
Hundredweight (112 pounds Avoirdupois) = 50.8 kilograms.
Inch = 0.0254 meter.
Inch = 2.54 centimeters.
Inch = 25.40 millimeters.
Kilogram = 2.2046 pounds, or 35.274 ounces.
Kiloliter (1000 liters) = 1.308 cubic yards, or 264.18 gallons.
Kilometer (1000 meters) = 0.62137 mile (3280 feet 10 inches).
Liter = 1.0567 quarts, 0.264 gallon (liquid), or 0.908 quart (dry)
Meter = 39.3700 inches, or 3.28083 feet.

Mile = 1.609 kilometers.
Mile = 5280 feet, or 1609.3 meters.
Millier or tonneau = 2204.6 pounds.
Milligram = 0.0154 grain.
Millimeter (1/1000 meter) = 0.0394 inch.
Myriagram = 22.046 pounds.
Myriameter (10,000 meters) = 6.2137 miles.
Ounce (Avoirdupois) = 28.350 grams.
Ounce (fluid) = 28.3966 cubic centimeters.
Ounce (Troy or Apothecaries) = 31.104 grams.
Peck = 9.08 liters.
Pint (liquid) = 0.47318 liter.
Pound (Avoirdupois) = 453.603 grams.
Pound (English) = 0.453 kilogram.
Pound (Troy) = 373.25 grams.
Quart (liquid) = 0.94636 liter.
Quintal = 220.46 pounds.
Scruple (Troy) = 1.296008 grams.
Ton = 20 hundredweight = 2240 pounds (Avoirdupois) 1016.070 kilograms.
Yard = 0.9144 meter.

TABLE OF MULTIPLES.

Centimeters × 0.3937 = inches.
Centimeters × 0.0328 = feet.
Centimeters, cubic, × 0.0338 = apothecaries' fluid ounces.
Diameter of a circle × 3.1416 = circumference.
Gallons × 3.785 = liters.
Gallons × 0.833565 = imperial gallons.
Gallons, imperial, × 1.199666 = U. S. gallons.
Gallons × 8.33505 = pounds of water.
Gallons, imperial, × 10 = pounds of water.
Gallons, imperial, × 4.54102 = liters.
Grains × 0.0648 = grams.
Inches × 0.0254 = meters.

Inches $\times$ 25.4 = millimeters.
Miles $\times$ 1.609 = kilometers.
Ounces, Troy, $\times$ 1.097 = ounces of avoirdupois.
Ounces, avoirdupois, $\times$ 0.9115 = ounces Troy.
Pounds, avoirdupois, $\times$ 0.4536 = kilograms.
Pounds, avoirdupois, $\times$ 0.8228572 = pounds Troy.
Pounds, Troy, $\times$ 0.37286 = kilograms.
Pounds, Troy, $\times$ 1.21527 = pounds avoirdupois.
Radius of a circle = 6.283185 $\times$ circumference.
Square of the radius $\times$ 3.1416 = area.
Square of the circumference of a circle $\times$ 0.07958 = area.

MISCELLANEOUS MEASURES.

Barrel of flour = 196 pounds.
Barrel of salt = 280 pounds.
Bale of cotton (in America) = 400 pounds.
Bale of cotton (in Egypt) = 90 pounds.
Bag of Sea Island cotton = 300 pounds.
Cable = 120 fathoms.
Can = 35 pounds.
Cask of lime = 240 pounds.
Fathom = 6 feet.
Hand = 4 inches.
Hogshead = 63 gallons.
Keg (nails) = 100 pounds.
Noggin or Nog. = $\frac{5}{16}$ of a pint.
Pace = 3.3 feet.
Palm = 3 inches.
Pipe = 2 hogsheads.
Stone = 14 pounds.
Tun = 2 pipes.
Cubic foot of water weighs 62.4 pounds.
Cubic foot of water is 7.48 gallons.
Gallon of water weighs 8⅓ pounds.
Gallon of water is 231 cubic inches.

In England, wool is sold by the sack, or boll, of 22 stones, which, at 14 pounds to the stone, is 308 pounds.

A pack of wool is 17 stones and 2 pounds, which is rated as a pack load for a horse. It is 240 pounds.

Sack of flour = 280 pounds.

A tod of wool is 2 stones of 14 pounds.

A wey of wool is 6¼ tods. Two weys, a sack.

A clove of wool is half a stone.

THERMOMETRY.

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
—10	—23.33	13	—10.56	36	2.22
—9	—22.78	14	—10.00	37	2.78
—8	—22.22	15	—9.44	38	3.33
—7	—21.67	16	—8.89	39	3.89
—6	—21.11	17	—8.33	40	4.44
—5	—20.56	18	—7.78	41	5.00
—4	—20.00	19	—7.22	42	5.56
—3	—19.44	20	—6.67	43	6.11
—2	—18.89	21	—6.11	44	6.67
—1	—18.33	22	—5.56	45	7.22
0	—17.78	23	—5.00	46	7.78
1	—17.22	24	—4.44	47	8.33
2	—16.67	25	—3.89	48	8.89
3	—16.11	26	—3.33	49	9.44
4	—15.56	27	—2.78	50	10.00
5	—15.00	28	—2.22	51	10.56
6	—14.44	29	—1.67	52	11.11
7	—13.89	30	—1.11	53	11.67
8	—13.33	31	—0.56	54	12.22
9	—12.78	32	—0.00	55	12.78
10	—12.22	33	0.56	56	13.33
11	—11.67	34	1.11	57	13.89
12	—11.11	35	1.67	58	14.44

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
59	15.00	93	33.89	127	52.78
60	15.66	94	34.44	128	53.34
61	16.11	95	35.00	129	53.89
62	16.67	96	35.56	130	54.45
63	17.22	97	36.11	131	55.00
64	17.78	98	36.67	132	55.56
65	18.33	99	37.22	133	56.12
66	18.89	100	37.78	134	56.67
67	19.44	101	38.34	135	57.23
68	20.00	102	38.89	136	57.78
69	20.56	103	39.45	137	58.34
70	21.11	104	40.00	138	58.89
71	21.67	105	40.56	139	59.45
72	22.22	106	41.12	140	60.00
73	22.78	107	41.67	141	60.56
74	23.33	108	42.23	142	61.12
75	23.89	109	42.78	143	61.67
76	24.44	110	43.34	144	62.23
77	25.00	111	43.89	145	62.78
78	25.56	112	44.45	146	63.34
79	26.11	113	45.00	147	63.89
80	26.67	114	45.56	148	64.45
81	27.22	115	46.22	149	65.00
82	27.78	116	46.67	150	65.56
83	28.33	117	47.23	151	66.12
84	28.89	118	47.78	152	66.67
85	29.44	119	48.34	153	67.23
86	30.00	120	48.89	154	67.78
87	30.56	121	49.45	155	68.34
88	31.11	122	50.00	156	68.89
89	31.67	123	50.56	157	69.45
90	32.22	124	51.12	158	70.00
91	32.78	125	51.67	159	70.56
92	33.33	126	52.23	160	71.12

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
161	71.67	195	90.56	229	109.44
162	72.23	196	81.12	230	110.00
163	72.78	197	91.67	231	110.55
164	73.34	198	92.23	232	111.11
165	73.89	199	92.78	233	111.67
166	74.45	200	93.34	234	112.22
167	75.00	201	93.89	235	112.78
168	75.56	202	94.44	236	113.33
169	76.12	203	95.00	237	113.89
170	76.67	204	95.55	238	114.44
171	77.23	205	96.11	239	115.00
172	77.78	206	96.67	240	115.55
173	78.34	207	97.22	241	116.11
174	78.89	208	97.78	242	116.67
175	79.45	209	98.33	243	117.22
176	80.00	210	98.89	244	117.78
177	80.56	211	99.44	245	118.33
178	81.12	212	100.00	246	118.89
179	81.67	213	100.55	247	119.44
180	82.23	214	101.11	248	120.00
181	82.78	215	101.67	249	120.55
182	83.34	216	102.22	250	121.11
183	83.89	217	102.78	251	121.67
184	84.45	218	103.33	252	122.22
185	85.00	219	103.89	253	122.78
186	85.56	220	104.44	254	123.33
187	86.12	221	105.00	255	123.89
188	86.67	222	105.55	256	124.44
189	87.23	223	106.11	257	125.00
190	87.78	224	106.67	258	125.55
191	88.34	225	107.22	259	126.11
192	88.89	226	107.78	260	126.67
193	89.45	227	108.33	261	127.22
194	00.00	228	108.89	262	127.78

Fahr.	Cent.	Fahr.	Cent.	Fahr.	Cent.
263	128.33	264	128.89	266	130.00
		265	129.44		

A method to transform Fahrenheit to Centigrade, or *vice versa*, is the formula:

$$\frac{C \times 9}{5} + 32 \text{ equals Fahrenheit.—}$$

$$F—32 \times \frac{5}{9} \text{ equals Centigrade.}$$

Comparison Between the Scales of Fahrenheit, Réaumur, and the Centigrade.

(Zero Fahrenheit corresponds with minus 17.8 Centigrade and minus 14.2 Réaumur.)

Cent.	Fahr.	Rmr.	Cent.	Fahr.	Rmr.
100	212	80	81	177.8	64.8
99	210.2	79.2	80	176	64.
98	208.4	78.4	79	174.2	63.2
97	206.6	77.6	78	172.4	62.4
96	204.8	76.8	77	170.6	61.6
95	203	76	76	168.8	60.8
94	201.2	75.2	75	167	60
93	199.4	74.4	74	165.2	59.2
92	197.6	73.6	73	163.4	58.4
91	195.8	72.8	72	161.6	57.6
90	194	72	71	159.8	56.8
89	192.2	71.2	70	158	56
88	190.4	70.4	69	156.2	55.2
87	188.6	69.6	68	154.4	54.4
86	186.8	68.8	67	152.6	53.6
85	185	68	66	150.8	52.8
84	183.2	67.2	65	149	52
83	181.4	66.4	64	147.2	51.2
82	179.6	65.6	63	145.4	50.4
			62	143.6	49.6

Cent.	Fahr.	Rmr.	Cent.	Fahr.	Rmr.
61	141.8	48.8	27	80.6	21.6
60	140	48	26	78.8	20.8
59	138.2	47.2	25	77	20
58	136.4	46.4	24	75.2	19.2
57	134.6	45.6	23	73.4	18.4
56	132.8	44.8	22	71.6	17.6
55	131	44	21	69.8	16.8
54	129.2	43.2	20	68	16
53	127.4	42.4	19	66.2	15.2
52	125.6	41.6	18	64.4	14.4
51	123.8	40.8	17	62.6	13.6
50	122	40	16	60.8	12.8
49	120.2	39.2	15	59	12
48	118.4	38.4	14	57.2	11.2
47	116.6	37.6	13	55.4	10.4
46	114.8	36.8	12	53.6	9.6
45	113	36	11	51.8	8.8
44	111.2	35.2	10	50	8
43	109.4	34.4	9	48.2	7.2
42	107.6	33.6	8	46.4	6.4
41	105.8	32.8	7	44.6	5.6
40	104	32	6	42.8	4.8
39	102.2	31.2	5	41	4
38	100.4	30.4	4	39.2	3.2
37	98.6	29.6	3	37.4	2.4
36	96.8	28.8	2	35.6	1.6
35	95	28	1	33.8	0.8
34	93.2	27.2	Zero	32	Zero
33	91.4	26.4	—1	30.2	—0.8
32	89.6	25.6	—2	28.4	—1.6
31	87.8	24.8	—3	26.6	—2.4
30	86	24	—4	24.8	—3.2
29	84.2	23.2	—5	23	—4
28	82.4	22.4	—6	21.2	—4.8

Cent.	Fahr.	Rmr.	Cent.	Fahr.	Rmr.
—7	19.4	—5.6	—29	—20.2	—23.2
—8	17.6	—6.4	—30	—22	—24
—9	15.8	—7.2	—31	—23.8	—24.8
—10	14	—8	—32	—25.6	—25.6
—11	12.2	—8.8	—33	—27.4	—26.4
—12	10.4	—9.6	—34	—29.2	—27.2
—13	8.6	—10.4	—35	—31	—28
—14	6.8	—11.2	—36	—32.8	—28.8
—15	5	—12	—37	—34.6	—29.6
—16	3.2	—12.8	—38	—36.4	—30.44
—17	1.4	—13.6	—39	—38.2	—31.2
—18	—0.4	—14.4	—40	—40	—32
—19	—2.2	—15.2	—41	—41.8	—32.8
—20	—4	—16	—42	—43.6	—33.6
—21	—5.8	—16.8	—43	—45.4	—34.4
—22	—7.6	—17.6	—44	—47.2	—35.2
—23	—9.4	—18.4	—45	—49	—36
—24	—11.2	—19.2	—46	—50.8	—36.8
—25	—13	—20	—47	—52.6	—37.6
—26	—14.8	—20.8	—48	—54.4	—38.4
—27	—16.6	—21.6	—49	—56.2	—39.2
—28	—18.4	—22.4			

AREOMETRY OR HYDROMETRY.

COMPARISON BETWEEN THE SPECIFIC GRAVITY OF BEAUMÉ AND TWADDLE.

Tw.	B.	Sp. Gr.	Tw.	B.	Sp. Gr.	Tw.	B.	Sp. Gr	Tw.	B.	Sp. Gr
0	0	1.000	44	26.0	1.220	88	44.1	1.440	132	57.4	1.660
1	0.7	1.005	45	26.4	1.225	89	44.4	1.445	133	57.7	1.665
2	1.4	1.010	46	26.9	1.230	90	44.8	1.450	134	57.9	1.670
3	2.1	1.015	47	27.4	1.235	91	45.1	1.455	135	58.2	1.675
4	2.7	1.020	48	27.9	1.240	92	45.4	1.460	136	58.4	1.680
5	3.4	1.025	49	28.4	1.245	93	45.8	1.465	137	58.7	1.685
6	4.1	1.030	50	28.8	1.250	94	46.1	1.470	138	58.9	1.690
7	4.7	1.035	51	29.3	1.255	95	46.4	1.475	139	59.2	1.695
8	5.4	1.040	52	29.7	1.260	96	46.7	1.480	140	59.5	1.700
9	6.0	1.045	53	30.2	1.265	97	47.1	1.485	141	59.7	1.705
10	6.7	1.050	54	30.6	1.270	98	47.4	1.490	142	60.0	1.710
11	7.4	1.055	55	31.1	1.275	99	47.8	1.495	143	60.2	1.715
12	8.0	1.060	56	31.5	1.280	100	48.1	1.500	144	60.4	1.720
13	8.7	1.065	57	32.0	1.285	101	48.4	1.505	145	60.6	1.725
14	9.4	1.070	58	32.4	1.290	102	48.7	1.510	146	60.9	1.730
15	10.0	1.075	59	32.8	1.295	103	49.0	1.515	147	61.1	1.735
16	10.6	1.080	60	33.3	1.300	104	49.4	1.520	148	61.4	1.740
17	11.2	1.085	61	33.7	1.305	105	49.7	1.525	149	61.6	1.745
18	11.9	1.090	62	34.2	1.310	106	50.0	1.530	150	61.8	1.750
19	12.4	1.095	63	34.6	1.315	107	50.3	1.535	151	62.1	1.755
20	13.0	1.100	64	35.0	1.320	108	50.6	1.540	152	62.3	1.760
21	13.6	1.105	65	35.4	1.325	109	50.9	1.545	153	62.5	1.765
22	14.2	1.110	66	35.8	1.330	110	51.2	1.550	154	62.8	1.770
23	14.9	1.115	67	36.2	1.335	111	51.5	1.555	155	63.0	1.775
24	15.4	1.120	68	36.6	1.340	112	51.8	1.560	156	63.2	1.780
25	16.0	1.125	69	37.0	1.345	113	52.1	1.565	157	63.5	1.785
26	16.5	1.130	70	37.4	1.350	114	52.4	1.570	158	63.7	1.790
27	17.1	1.135	71	37.8	1.355	115	52.7	1.575	159	64.0	1.795
28	17.7	1.140	72	38.2	1.360	116	53.0	1.580	160	64.2	1.800
29	18.3	1.145	73	38.6	1.365	117	53.3	1.585	161	64.4	1.805
30	18.8	1.150	74	39.0	1.370	118	53.6	1.590	162	64.6	1.810
31	19.3	1.155	75	39.4	1.375	119	53.9	1.595	163	64.8	1.815
32	19.8	1.160	76	39.8	1.380	120	54.1	1.600	164	65.0	1.820
33	20.3	1.165	77	40.1	1.385	121	54.4	1.605	165	65.2	1.825
34	20.9	1.170	78	40.5	1.390	122	54.7	1.610	166	65.5	1.830
35	21.4	1.175	79	40.8	1.395	123	55.0	1.615	167	65.7	1.835
36	22.0	1.180	80	41.2	1.400	124	55.2	1.620	168	65.9	1.840
37	22.5	1.185	81	41.6	1.405	125	55.5	1.625	169	66.1	1.845
38	23.0	1.190	82	42.0	1.410	126	55.8	1.630	170	66.3	1.850
39	23.5	1.195	83	42.3	1.415	127	56.0	1.635	171	66.5	1.855
40	24.0	1.200	84	42.7	1.420	128	56.3	1.640	172	66.7	1.860
41	24.5	1.205	85	43.1	1.425	129	56.6	1.645	173	67.0	1.865
42	25.0	1.210	86	43.4	1.430	130	56.9	1.650			
43	25.5	1.215	87	43.8	1.435	131	57.1	1.655			

TO CHANGE FROM TWADDLE SCALE TO SPECIFIC GRAVITY, OR FROM GRAVITY TO TWADDLE SCALE.

In order to change degrees Twaddle into specific gravity, multiply by 5, add 1000, and divide by 1000. Example: Change 168° Twaddle into specific gravity.

$$
\begin{array}{r}
168 \times 5 \\
\hline
840 \\
1,000 \\
\hline
1,000)\,1.840 \\
1.84 \text{ Spec. Grav.}
\end{array}
$$

To change specific gravity into degrees Twaddle, multiply by 1000, subtract 1000, and divide by 5. Example: Change 1.84 specific gravity into degrees Twaddle.

$$
\begin{array}{r}
1.84 \times 1,000 \\
\hline
1,840 \\
1,000 \\
\hline
5)\ 840 \\
\hline
168^\circ \text{ Tw.}
\end{array}
$$

The degrees of Twaddle's hydrometer are easily turned into specific gravity numbers—a quality which makes it preferable to any other hydrometer in use. The rule is to multiply the indicated degree by 5, and add 1000 to the product; for example, 9 degrees Twaddle equals specific gravity 1045; 25 degrees Twaddle equals specific gravity 1125; 100 degrees Twaddle equals specific gravity 1500; and so on. To bring specific gravity numbers to degrees of Twaddle, subtract 1000, and divide the remainder by 5; for example: specific gravity 1000 degrees equals 20 degrees Twaddle.

If the sample is too viscous to determine the density directly, a weighed portion of it can be first diluted with a weighed quantity of water, or a weighed portion can be dissolved and diluted to a known volume with water. In the first instance the per cent. of total solids is to be calculated by the following formula:

$$\text{Per cent. of solids in the undiluted material} = \frac{WS}{w}.$$

S = per cent. of solids in the diluted material.
W = weight of the diluted material.
w = weight of the sample taken for dilution.

If the dilution was made to a definite volume, the following formula is to be used:

$$\text{Per cent. of solids in the undiluted material} = \frac{VDS}{w}.$$

V = volume of the diluted solution.
D = specific gravity of the diluted solution.
S = per cent. of solids in the diluted solution.
w = weight of the sample taken for dilution.

To reduce a liquid to a desired specific gravity:
Let v equal the volume of the first liquid.
Let B equal the Beaumé of the first liquid.
Let b equal the Beaumé of the second or reducing liquid.
Let a equal the Beaumé required.
Let z equal the volume of the reducing liquid.

$$z = \frac{av - vB}{b - a}.$$

SULPHURIC ACID.

The Manufacturing Chemists' Association in 1904 adopted the following figures as representing the per cent. of H_2SO_4 in an oil of vitriol. Since colorists rarely or never need to look up an acid

below 80 per cent. oil of vitriol, the table only goes to that degree.

Beaumé.°	Specific Gravity.	Tw.°	H_2SO_4. Per Cent.	Oil of Vitriol. Per cent.
66	1.8354	167.1	93.19	100
65¾	1.8297	165.9	91.80	98.51
65½	1,8239	164.8	90.60	97.22
65¼	1.8182	163.6	89.55	96.10
65	1.8125	162.5	88.65	95.13
64¾	1.8068	161.4	87.81	94.23
64½	1.8012	160.2	87.04	93.40
64¼	1.7957	159.1	86.33	92.64
64	1.7901	158.0	85.66	91.92
63	1.7683	153.7	83.34	89.43
62	1.7470	149.4	81.30	87.24
61	1.7262	145.2	79.43	85.23
60	1.7059	141.2	77.67	83.35
59	1.6860	137.2	75.99	81.54
58	1.6667	133.3	74.36	79.97

SPECIFIC GRAVITY OF ACETIC ACID SOLUTIONS 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0007	1	1.0157	11
1.0022	2	1.0171	12
1.0037	3	1.0185	13
1.0052	4	1.0200	14
1.0067	5	1.0214	15
1.0083	6	1.0228	16
1.0098	7	1.0242	17
1.0113	8	1.0256	18
1.0127	9	1.0270	19
1.0142	10	1.0284	20

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0298	21	1.0646	54
1.0311	22	1.0653	55
1.0324	23	1.0660	56
1.0337	24	1.0666	57
1.0350	25	1.0673	58
1.0363	26	1.0679	59
1.0375	27	1.0685	60
1.0388	28	1.0691	61
1.0400	29	1.0697	62
1.0412	30	1.0702	63
1.0424	31	1.0707	64
1.0436	32	1.0712	65
1.0447	33	1.0717	66
1.0459	34	1.0721	67
1.0470	35	1.0725	68
1.0481	36	1.0729	69
1.0492	37	1.0733	70
1.0502	38	1.0737	71
1.0513	39	1.0740	72
1.0523	40	1.0742	73
1.0533	41	1.0744	74
1.0543	42	1.0746	75
1.0552	43	1.0747	76
1.0562	44	1.0748	77
1.0571	45	1.0748	78
1.0580	46	1.0748	79
1.0589	47	1.0748	80
1.0598	48	1.0747	81
1.0607	49	1.0746	82
1.0615	50	1.0744	83
1.0623	51	1.0742	84
1.0631	52	1.0739	85
1.0638	53	1.0736	86

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0731	87	1.0674	94
1.0726	88	1.0660	95
1.0720	89	1.0644	96
1.0713	90	1.0625	97
1.0705	91	1.0604	98
1.0696	92	1.0580	99
1.0686	93	1.0553	100

NOTE.—The specific gravity 1.0553 may indicate either of two solutions of different strengths. To determine whether an acid is stronger than 78 per cent. (the maximum specific gravity) some water is added; if the specific gravity rises it is stronger, if it falls it is weaker than 78 per cent. acid.

SPECIFIC GRAVITY OF HYDROCHLORIC ACID SOLUTIONS AT 15° C.

Beaumé.°	Specific Gravity.	Tw.°	Per cent. HCL.
1.00	1.0069	1.38	1.40
2.00	1.0140	2.80	2.82
3.00	1.0211	4.22	4.25
4.00	1.0284	5.68	5.69
5.00	1.0357	7.14	7.15
5.50	1.0394	7.88	7.89
6.00	1.0432	8.64	8.64
6.50	1.0469	9.38	9.40
7.00	1.0507	10.17	10.17
7.50	1.0545	10.90	10.94
8.00	1.0584	11.68	11.71
8.50	1.0623	12.46	12.48
9.00	1.0662	13.24	13.26
9.50	1.0701	14.02	14.04
10.00	1.0741	14.82	14.83

Beaumé.°	Specific Gravity.	Tw.°	Per cent. HCL.
10.50	1.0781	15.62	15.62
11.00	1.0821	16.42	16.41
11.50	1.0861	17.22	17.21
12.00	1.0902	18.04	18.01
12.50	1.0943	18.86	18.82
13.00	1.0985	19.70	19.63
13.50	1.1027	20.54	20.45
14.00	1.1069	21.38	21.27
14.50	1.1111	22.22	22.09
15.00	1.1154	23.08	22.92
15.50	1.1197	23.94	23.75
16.0	1.1240	24.80	24.57
16.5	1.1283	25.66	25.39
17.0	1.1328	26.56	26.22
17.5	1.1372	27.44	27.07
18.0	1.1417	28.34	27.92
18.5	1.1462	29.24	28.78
19.0	1.1508	30.16	29.65
19.5	1.1554	31.08	30.53
20.0	1.1600	32.00	31.45
20.5	1.1647	32.94	32.38
21.0	1.1694	33.88	33.31
21.5	1.1741	34.82	34.26
22.0	1.1789	35.78	35.21
22.5	1.1836	36.72	36.16
23.0	1.1885	37.70	37.14
23.5	1.1934	38.68	38.26
24.0	1.1983	39.66	39.41
24.5	1.2033	40.66	40.55
25.0	1.2083	41.66	41.72
25.5	1.2134	42.68	43.40

FORMALDEHYDE—SPECIFIC GRAVITY OF SOLUTIONS.

Specific Gravity at 15.6°C.	Per cent. by Weight.	Per cent. by Volume.
1.0025	1.0	1.0
1.0125	5.0	5.0
1.0250	10.0	10.25
1.0380	15.0	15.6
1.0530	20.0	21.1
1.0670	25.0	26.7
1.0830	30.0	32.5
1.1040	35.0	38.6
1.1250	40.0	45.0

This table is by W. A. Davis, in the Journal of Society of Chemical Industry, 1897, 502.

BLEACHING POWDER (CALCIUM HYPOCHLORITE) SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. Available Cl.
1.008	1	0.5
1.015	2	1.0
1.023	3	1.5
1.030	4	2.0
1.037	5	2.5
1.045	6	3.0
1.053	7	3.5
1.060	8	4.0
1.069	9.2	4.5
1.078	10.4	5.0
1.087	11.5	5.5
1.097	12.6	6.0
1.105	13.6	6.4

CALCIUM ACETATE SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. $Ca(C_2H_3O_2)_2$.
1.0260	3.4	5
1.0530	7.1	10
1.0792	10.5	15
1.1051	13.6	20
1.1321	16.8	25
1.1594	19.8	30

NITRIC ACID—SPECIFIC GRAVITY AND STRENGTH OF SOLUTIONS AT 15° C.

Beaumé.°	Specific Gravity.	Tw.°	Per cent. HNO_3.
10.00	1.0741	14.82	12.86
11.00	1.0821	16.42	14.13
12.00	1.0902	18.04	15.41
13.00	1.0985	19.70	16.72
14.00	1.1069	21.38	18.04
15.00	1.1154	23.08	19.36
16.00	1.1240	24.80	20.69
17.00	1.1328	26.56	22.04
18.00	1.1417	28.34	23.42
19.00	1.1508	30.16	24.82
20.00	1.1600	32.00	26.24
21.00	1.1694	33.88	27.67
22.00	1.1789	35.78	29.07
23.00	1.1885	37.70	30.49
24.00	1.1983	39.66	31.94
25.00	1.2083	41.66	33.42
26.00	1.2185	43.70	34.94
27.00	1.2288	45.76	36.48
28.00	1.2393	47.86	38.06
29.00	1.2500	50.00	39.66

Beaumé.°	Specific Gravity.	Tw.°	Per cent. HNO_3.
30.00	1.2609	52.18	41.30
30.50	1.2664	53.28	42.14
31.00	1.2719	54.38	43.00
31.50	1.2775	55.50	43.89
32.00	1.2832	56.64	44.78
32.50	1.2889	57.78	45.68
33.00	1.2946	58.92	46.58
33.50	1.3004	60.08	47.49
34.00	1.3063	61.26	48.42
34.50	1.3122	62.44	49.35
35.00	1.3182	63.64	50.32
35.50	1.3242	64.84	51.30
36.00	1.3303	66.06	52.30
36.50	1.3364	67.28	53.52
37.00	1.3426	68.52	54.36
37.50	1.3488	69.76	55.43
38.00	1.3551	71.02	56.52
38.50	1.3615	72.30	57.65
39.00	1.3679	73.58	58.82
39.50	1.3744	74.88	60.06
40.00	1.3810	76.20	61.38
40.50	1.3876	77.52	62.77
41.00	1.3942	78.84	64.20
41.50	1.4010	80.20	65.67
42.00	1.4078	81.56	67.18
42.25	1.4112	82.24	67.95
42.50	1.4146	82.92	68.73
42.75	1.4181	83.62	69.52
43.00	1.4216	84.32	70.33
43.25	1.4251	85.02	71.15
43.50	1.4286	85.72	71.98
43.75	1.4321	86.42	72.82
44.00	1.4356	87.12	73.67

Beaumé.°	Specific Gravity.	Tw.°	Per cent. HNO_3.
44.25	1.4392	87.84	74.53
44.50	1.4428	88.56	75.40
44.75	1.4464	89.28	76.28
45.00	1.4500	90.00	77.17
45.25	1.4536	90.72	78.07
45.50	1.4573	91.46	79.03
45.75	1.4610	92.20	80.04
46.00	1.4646	92.92	81.08
46.25	1.4684	93.68	82.18
46.50	1.4721	94.42	83.33
46.75	1.4758	95.16	84.48
47.00	1.4796	95.92	85.70
47.25	1.4834	96.68	86.98
47.50	1.4872	97.44	88.32
47.75	1.4910	98.20	89.76
48.00	1.4948	98.96	91.35
48.25	1.4987	99.74	93.13
48.50	1.5026	100.52	95.11

ALUMINIUM ACETATE SOLUTIONS — STRENGTH AND SPECIFIC GRAVITY AT 17° C.

Specific Gravity.	Degrees Beaumé.	Per cent. Al_2O_3.
1.012	1.6	0.5
1.025	3.4	1.0
1.038	5.0	1.5
1.050	6.7	2.0
1.062	8.3	2.5
1.074	9.9	3.0
1.086	11.3	3.5
1.098	12.8	4.0
1.100	13.0	4.5

ALUMINIUM NITRO-ACETATE SOLUTIONS—SPECIFIC GRAVITY AND STRENGTH AT 17° C.

Specific Gravity.	Degrees Beaumé.	Per cent. Al_2O_3.
1.012	1.6	0.5
1.025	3.4	1.0
1.039	5.3	1.5
1.054	7.2	2.0
1.068	9.1	2.5
1.083	11.0	3.0
1.097	12.7	3.5
1.112	14.4	4.0
1.126	16.1	4.5
1.141	17.8	5.0
1.156	19.4	5.5
1.160	19.8	5.64

ALUMINIUM SULPHATE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $Al_2(SO_4)_3$.	Specific Gravity.	Per cent. $Al_2(SO_4)_3$.
1.0170	1	1.1467	14
1.0270	2	1.1574	15
1.0370	3	1.1668	16
1.0470	4	1.1770	17
1.0569	5	1.1876	18
1.0670	6	1.1971	19
1.0768	7	1.2074	20
1.0870	8	1.2168	21
1.0968	9	1.2274	22
1.1071	10	1.2375	23
1.1171	11	1.2473	24
1.1270	12	1.2573	25
1.1369	13		

ALUMINIUM CHLORIDE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. Al_2Cl_6.	Specific Gravity.	Per cent. Al_2Cl_6.
1.00721	1	1.17092	22
1.01443	2	1.17953	23
1.02164	3	1.18815	24
1.02885	4	1.19676	25
1.03603	5	1.20584	26
1.04353	6	1.21493	27
1.05099	7	1.22406	28
1.05845	8	1.23310	29
1.06591	9	1.24219	30
1.07337	10	1.25184	31
1.08120	11	1.26149	32
1.08902	12	1.27115	33
1.09684	13	1.28080	34
1.10466	14	1.29046	35
1.11248	15	1.30066	36
1.12073	16	1.31086	37
1.12897	17	1.32106	38
1.13721	18	1.33126	39
1.14545	19	1.34146	40
1.15370	20	1.35224	41
1.16231	21	1.35359	41.126

SODA SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Degree Bé.	Per cent. by Weight. Na_2CO_3	$Na_2CO_3 + 10H_2O$.
1.007	1	0.67	1.807
1.014	2	1.33	3.587
1.022	3	2.09	5.637
1.029	4	2.76	7.444
1.036	5	3.43	9.251

Specific Gravity.	Degree Bé.	Per cent. by Weight. Na_2CO_3	$Na_2CO_3 + 10H_2O$.
1.045	6	4.29	11.570
1.052	7	4.94	13.323
1.060	8	5.71	15.400
1.067	9	6.37	17.180
1.075	10	7.12	19.203
1.083	11	7.88	21.252
1.091	12	8.62	23.248
1.100	13	9.43	25.432
1.108	14	10.19	27.482
1.116	15	10.95	29.532
1.125	16	11.81	31.851
1.134	17	12.61	34.009
1.142	18	13.16	35.493
1.152	19	14.24	38.405

GLAUBER'S SALT SOLUTIONS (SODIUM SULPHATE CRYSTALS)—SPECIFIC GRAVITY AT 19° C.

Specific Gravity.	Per cent. $Na_2SO_4 + 10H_2O$.	Na_2SO_4.
1.0040	1	0.441
1.0079	2	0.881
1.0118	3	1.323
1.0158	4	1.764
1.0198	5	2.205
1.0238	6	2.646
1.0278	7	3.087
1.0318	8	3.528
1.0358	9	3.969
1.0398	10	4.410
1.0439	11	4.851
1.0479	12	5.292
1.0520	13	5.373

CHROMIUM CHLORIDE SOLUTION—SPECIFIC GRAVITY AND STRENGTH AT 15° C.

Specific Gravity.	Per cent. Cr_2O_3.	Specific Gravity.	Per cent. Cr_2O_3.
1.008	.5	1.148	9.0
1.016	1.00	1.164	10.00
1.032	2.00	1.180	11.00
1.048	3.00	1.197	12.00
1.065	4.00	1.213	13.00
1.082	5.00	1.229	14.00
1.098	6.00	1.245	15.00
1.115	7.00	1.261	16.00
1.131	8.00	1.276	17.00

CHROMIUM ACETATE (GREEN) SOLUTION—SPECIFIC GRAVITY AND STRENGTH AT 15° C.

Specific Gravity.	Per cent. Cr_2O_3.	Specific Gravity.	Per cent. Cr_2O_3.
1.007	.5	1.084	6.00
1.014	1.00	1.091	6.50
1.021	1.50	1.098	7.00
1.028	2.00	1.105	7.50
1.035	2.50	1.112	8.00
1.042	3.00	1.119	8.50
1.049	3.50	1.126	9.00
1.056	4.00	1.133	9.50
1.063	4.50	1.140	10.00
1.070	5.00	1.147	10.50
1.077	5.50	1.151	10.70

Specific Gravity.	Per cent. $Na_2SO_4 + 10H_2O$.	Na_2SO_4.
1.0560	14	6.174
1.0601	15	6.615
1.0642	16	7.056
1.0683	17	7.497
1.0725	18	7.938
1.0766	19	8.379
1.0807	20	8.820
1.0849	21	9.261
1.0890	22	9.702
1.0931	23	10.143
1.0973	24	10.584
1.1015	25	11.025
1.1057	26	11.466
1.1100	27	11.907
1.1142	28	12.348
1.1184	29	12.789
1.1226	30	13.230

COMMON SALT SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. NaCl.	Specific Gravity.	Per cent. NaCl.
1.00725	1	1.08859	12
1.01450	2	1.09622	13
1.02174	3	1.10384	14
1.02899	4	1.11146	15
1.03624	5	1.11938	16
1.04366	6	1.12730	17
1.05108	7	1.13523	18
1.05851	8	1.14315	19
1.06593	9	1.15107	20
1.07335	10	1.15931	21
1.08097	11	1.16755	22

Specific Gravity.	Per cent. NaCl.	Specific Gravity.	Per cent. NaCl.
1.17580	23	1.19228	25
1.18404	24	1.20098	26

SODIUM BISULPHITE SOLUTIONS—SPECIFIC GRAVITY AND STRENGTH AT 15° C.

Specific Gravity.	Degrees Bé.	Per cent. $NaHSO_3$.	Per cent. SO_2.
1.008	1	1.6	0.4
1.022	3	2.1	1.3
1.038	5	3.6	2.2
1.052	7	5.1	3.1
1.068	9	6.5	3.9
1.084	11	8.0	4.8
1.100	13	9.5	5.7
1.116	15	11.2	6.8
1.134	17	12.8	7.8
1.152	19	14.6	9.0
1.171	21	16.5	10.2
1.190	23	18.5	11.5
1.210	25	20.9	12.9
1.230	27	23.5	14.5
1.252	29	25.9	15.9
1.275	31	28.9	17.8
1.298	33	31.7	19.6
1.321	35	34.7	22.5
1.345	37	38.0	23.6

SODIUM ACETATE SOLUTIONS—SPECIFIC GRAVITY AT 17.5° C.

Specific Gravity.	Per cent. $NaC_2H_3O_2$.	Per cent. $NaC_2H_3O_2 + 3H_2O$.
1.0150	3.015	5
1.0310	6.030	10

Specific Gravity.	Per cent. $NaC_2H_3O_2$.	Per cent. $NaC_2H_3O_2 + 3H_2O$.
1.0470	9.045	15
1.0630	12.060	20
1.0795	15.075	25
1.0960	18.090	30
1.1130	21.105	35
1.1305	24.120	40
1.1485	27.135	45
1.1670	30.150	50

SULPHUROUS ACID—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. SO_2.	Specific Gravity.	Per cent. SO_2.
1.0028	0.5	1.0302	5.5
1.0056	1.0	1.0328	6.0
1.0085	1.5	1.0353	6.5
1.0113	2.0	1.0377	7.0
1.0141	2.5	1.0401	7.5
1.0168	3.0	1.0426	8.0
1.0194	3.5	1.0450	8.5
1.0221	4.0	1.0474	9.0
1.0248	4.5	1.0497	9.5
1.0275	5.0	1.0520	10.0

STANNIC CHLORIDE SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $SnCl_4 + 5H_2O$.	Specific Gravity.	Per cent. $SnCl_4 + 5H_2O$.
1.012	2	1.059	10
1.024	4	1.072	12
1.036	6	1.084	14
1.048	8	1.097	16

Specific Gravity.	Per cent. $SnCl_4 + 5H_2O$.	Specific Gravity.	Per cent. $SnCl_4 + 5H_2O$.
1.110	18	1.447	58
1.124	20	1.468	60
1.137	22	1.491	62
1.151	24	1.514	64
1.165	26	1.538	66
1.180	28	1.563	68
1.195	30	1.587	70
1.210	32	1.614	72
1.227	34	1.641	74
1.242	36	1.669	76
1.259	38	1.698	78
1.276	40	1.727	80
1.293	42	1.759	82
1.310	44	1.791	84
1.329	46	1.824	86
1.347	48	1.859	88
1.366	50	1.893	90
1.386	52	1.932	92
1.406	54	1.969	94
1.426	56	1.988	96

TANNIN SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0040	1.0	1.0072	1.8
1.0044	1.1	1.0076	1.9
1.0048	1.2	1.0080	2.0
1.0052	1.3	1.0084	2.1
1.0056	1.4	1.0088	2.2
1.0060	1.5	1.0092	2.3
1.0064	1.6	1.0096	2.4
1.0068	1.7	1.0100	2.5

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0104	2.6	1.0172	4.3
1.0108	2.7	1.0176	4.4
1.0112	2.8	1.0180	4.5
1.0116	2.9	1.0184	4.6
1.0120	3.0	1.0188	4.7
1.0124	3.1	1.0192	4.8
1.0128	3.2	1.0196	4.9
1.0132	3.3	1.0200	5.0
1.0136	3.4	1.0242	6.0
1.0140	3.5	1.0324	8.0
1.0144	3.6	1.0406	10.0
1.0148	3.7	1.0489	12.0
1.0152	3.8	1.0572	14.0
1.0156	3.9	1.0656	16.0
1.0160	4.0	1.0740	18.0
1.0164	4.1	1.0824	20.0
1.0168	4.2		

TARTARIC ACID SOLUTIONS—SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.0045	1	1.0969	20
1.0090	2	1.1072	22
1.0179	4	1.1175	24
1.0273	6	1.1282	26
1.0371	8	1.1393	28
1.0469	10	1.1505	30
1.0565	12	1.1615	32
1.0661	14	1.1726	34
1.0761	16	1.1840	36
1.0865	18	1.1959	38

Specific Gravity.	Per cent.	Specific Gravity.	Per cent.
1.2078	40	1.2696	50
1.2198	42	1.2828	52
1.2317	44	1.2961	54
1.2441	46	1.3093	56
1.2568	48	1.3220	57.9
		Saturated.	

TIN CRYSTALS (STANNOUS CHLORIDE) SOLUTION—STRENGTH AND SPECIFIC GRAVITY AT 15° C.

Specific Gravity.	Per cent. $SnCl_2 + 2H_2O$.	Specific Gravity.	Per cent. $SnCl_2 + 2H_2O$.
1.013	2	1.330	40
1.026	4	1.352	42
1.040	6	1.374	44
1.054	8	1.397	46
1.068	10	1.421	48
1.083	12	1.445	50
1.097	14	1.471	52
1.113	16	1.497	54
1.128	18	1.525	56
1.144	20	1.554	58
1.161	22	1.582	60
1.177	24	1.613	62
1.194	26	1.644	64
1.212	28	1.677	66
1.230	30	1.711	68
1.249	32	1.745	70
1.268	34	1.783	72
1.288	36	1.821	74
1.309	38	1.840	75

TARTAR EMETIC SOLUTIONS—STRENGTH AND SPECIFIC GRAVITY AT 17.5° C.

Specific Gravity.	Per cent. $SbOKC_4H_4O_6 + \frac{1}{2} H_2O$.	Specific Gravity.	Per cent. $SbOKC_4H_4O_6 + \frac{1}{2} H_2O$.
1.005	0.5	1.022	3.5
1.007	1.0	1.027	4.0
1.009	1.5	1.031	4.5
1.012	2.0	1.035	5.0
1.015	2.5	1.038	5.5
1.018	3.0	1.044	6.0

WATER ANALYSIS.

Analyses of water are sometimes reported as parts per million, and sometimes grains per imperial gallon, and sometimes grains per United States gallon. The following table gives all three values:

Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
1	0.0700	0.0583	14	0.9800	0.8165
2	0.1400	0.1166	15	1.0500	0.8747
3	0.2100	0.1749	16	1.1200	0.9330
4	0.2800	0.2332	17	1.1900	0.9914
5	0.3500	0.2915	18	1.2600	1.0497
6	0.4200	0.3499	19	1.3300	1.1080
7	0.4900	0.4082	20	1.4000	1.1663
8	0.5600	0.4665	21	1.4700	1.2246
9	0.6300	0.5248	22	1.5400	1.2829
10	0.7000	0.5831	23	1.6100	1.3413
11	0.7700	0.6414	24	1.6800	1.3996
12	0.8400	0.6998	25	1.7500	1.4579
13	0.9100	0.7581	26	1.8200	1.5162

Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
27	1.8900	1.5745	58	4.0600	3.3824
28	1.9600	1.6329	59	4.1300	3.4407
29	2.0300	1.6912	60	4.2000	3.4990
30	2.1000	1.7495	61	4.2700	3.5573
31	2.1700	1.8078	62	4.3400	3.6157
32	2.2400	1.8661	63	4.4100	3.6740
33	2.3100	1.9244	64	4.4800	3.7323
34	2.3800	1.9828	65	4.5500	3.7909
35	2.4500	2.0411	66	4.6200	3.8489
36	2.5200	2.0994	67	4.6900	3.9073
37	2.5900	2.1577	68	4.7600	3.9656
38	2,6600	2.2160	69	4.8300	4.0239
39	2.7300	2.2745	70	4.9000	4.0822
40	2.8000	2.3327	71	4.9700	4.1405
41	2.8700	2.3910	72	5.0400	4.1988
42	2.9400	2.4493	73	5.1100	4.2575
43	3.0100	2.5076	74	5.1800	4.3155
44	3.0800	2.5659	75	5.2500	4.3738
45	3.1500	2.6243	76	5.3200	4.4321
46	3.2200	2.6826	77	5.3900	4.4904
47	3.2900	2.7409	78	5.4600	4.5488
48	3.3600	2.7992	79	5.5300	4.6071
49	3.4300	2.8575	80	5.6000	4.6654
50	3.5000	2.9129	81	5.6700	4.7237
51	3.5700	2.9742	82	5.7400	4.7820
52	3.6400	3.0325	83	5.8100	4.8403
53	3.7100	3.0908	84	5.8800	4.8987
54	3.7800	3.1491	85	5.9500	4.9570
55	3.8500	3.2074	86	6.0200	5.0154
56	3.9200	3.2658	87	6.0900	5.0736
57	3.9900	3.3241	88	6.1600	5.1319

Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.	Parts per Million.	Grains per Imperial Gallon.	Grains per United States Gallon.
89	6.2300	5.1903	95	6.6500	5.5402
90	6.3000	5.2486	96	6.7200	5.5985
91	6.3700	5.3069	97	6.7900	5.6568
92	6.4400	5.3652	98	6.8600	5.7151
93	6.5100	5.4235	99	6.9300	5.7734
94	6.5800	5.4818	100	7.0000	5.8318

SYMBOLS AND ATOMIC WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomic Weight. H = 1.	O = 16.	Richards.	German.
Aluminum	Al	26.9	27.1	27.1	27.1
Antimony	Sb	119.3	120.2	120.0	120.
Argon	A	39.6	39.9	39.9?	40.
Arsenic	As	74.45	75.0	75.0	75.
Barium	Ba	136.4	137.40	137.43	137.4
Bismuth	Bi	206.9	208.5	208.0	208.5
Boron	B	10.9	11.0	10.95	11.
Bromine	Br	79.36	79.96	79.955	79.96
Cadmium	Cd	111.55	112.4	112.3	112.
Caesium	Cs	132.	133.	132.9	133.
Calcium	Ca	39.8	40.1	40.1	40.
Carbon	C	11.91	12.0	12.001	12.00
Cerium	Ce	139.	140.	140.	140.
Chlorine	Cl	35.18	35.45	35.455	35.45
Chromium	Cr	51.7	52.1	52.14	52.1
Cobalt	Co	58.55	59.00	59.00	59.
Columbium (Niobium)	Cb	93.3	94.	94.	94.
Copper	Cu	63.1	63.6	63.60	63.6
Erbium	Er	164.8	166.0	166.	166.

Name.	Symbol.	Atomic Weight. H = 1.	O = 16.	Richards.	German.
Fluorine	F	18.9	19.05	19.05	19.
Gadolinium	Gd	155.	156.	156.	...
Gallium	Ga	69.5	70.0	70.0	70.
Germanium	Ge	71.9	72.5	72.5	72.
Glucinum (Beryllium)	Gl	9.0	9.1	9.1	9.1
Gold	Au	195.7	197.2	197.3	197.2
Helium	He	4.	4.	4.0?	4.
Hydrogen	H	1.000	1.008	1.0075	1.01
Indium	In	113.1	114.0	114.	114.
Iodine	I	125.90	126.85	126.85	126.85
Iridium	Ir	191.5	193.0	193.0	193.
Iron	Fe	55.46	55.88	56.0	56.
Krypton	Kr	81.2	81.8	.....	81.8
Lanthanum	La	137.9	138.9	138.5	138.
Lead	Pb	205.35	206.92	206.92	206.9
Lithium	Li	6.98	7.03	7.03	7.03
Magnesium	Mg	24.1	24.3	24.36	24.36
Manganese	Mn	54.6	55.0	55.02	55.
Mercury	Hg	198.50	200.0	200.0	200.3
Molybdenum	Mo	95.3	96.0	96.0	96.
Neodymium	Ne	142.5	143.6	143.6	144.
Neon		19.9	20.	.....	20.
Nickel	Ni	58.3	58.70	58.70	58.7
Nitrogen	N	13.93	14.04	14.045	14.04
Osmium	Os	189.6	191.0	190.8	191.
Oxygen	O	15.88	16.000	16.0000	16.00
Palladium	Pd	105.7	106.5	106.5	106.
Phosphorus	P	30.77	31.0	31.0	31.
Platinum	Pt	193.3	194.8	195.2	194.8
Potassium	K	38.86	39.15	39.140	39.15
Praseodymium	Pr	139.4	140.5	140.5	140.
Radium	Ra	223.3	225.	.....	....

Name.	Symbol.	Atomic Weight. H = 1.	O = 16.	Richards.	German.
Rhodium	Rh	102.2	103.0	103.0	103.
Rubidium	Rb	84.8	85.4	85.44	85.4
Ruthenium	Ru	100.9	101.7	101.7	101.7
Samarium	Sa	148.9	150.0	150.0	150.
Scandium	Sc	43.8	44.1	44.	44.1
Selenium	Se	78.6	79.2	79.2	79.1
Silicon	Si	28.2	28.4	28.4	28.4
Silver	Ag	107.12	107.93	107.930	107.93
Sodium	Na	22.88	23.05	23.050	23.05
Strontium	Sr	86.94	87.60	87.68	87.6
Sulphur	S	31.83	32.06	32.065	32.06
Tantalum	Ta	181.6	183.0	183.	183.
Tellurium	Te	126.6	127.6	127.5	127.
Terbium	Tb	158.8	160.	160.	....
Thallium	Tl	202.61	204.15	204.15	204.1
Thorium	Th	230.8	232.5	233.	232.
Thulium	Tm	169.7	171.0	170.	....
Tin	Sn	118.1	119.0	119.0	118.5
Titanium	Ti	47.7	48.10	48.17	48.1
Tungsten	W	182.6	184.	184.4	184.
Uranium	U	236.7	238.5	240.	239.5
Vanadium	V	50.8	51.2	51.4	51.2
Xenon	X	127.	128.	....	128.
Ytterbium	Yb	171.7	173.0	173.	173.
Yttrium	Yt	88.3	89.0	89.0	89.
Zinc	Zn	64.9	65.4	65.40	65.4
Zirconium	Zr	89.9	90.6	90.5	90.6

PART II

Identification of Dyestuffs

The Identification of Coloring Matters on Fibres

THE IDENTIFICATION OF DYESTUFFS ON VEGETABLE FIBRES.

By Arthur G. Green, M.Sc., F.I.C., F.C.S., assisted by H. Yeoman, J. R. Jones, F. G. C. Stephens and G. A. Haley.

In a former communication a systematic method for the identification of dyestuffs on animal fibres has been described. In this scheme of analysis the dyeing properties of the coloring matter present on the fibre, *i.e.*, whether acid, basic, mordant, direct, etc., are determined by means of so-called "stripping" tests; while its chemical relationships are ascertained by its behavior on reduction and reoxidation.

In endeavoring to apply the same principles to analysis of colors on vegetable fibres (cotton, several initial difficulties were encountered, arising more especially from the influence exerted by mordants on the properties of the dyestuffs and the difference between the affinity of the latter for the types of fibre. Many basic dyestuffs, for instance, which if dyed on wool are easily reduced by sodium hydrosulphite, are scarcely attacked by this reagent when fixed on tannin-mordanted cotton. Nor can basic dyestuffs so fixed be stripped by acetic acid as they can from the wool fibre. Further, while in the case of wool, the leuco

compounds of dyestuffs remain in great part attached to the fibre, and can therefore be reoxidized, this is frequently not the case with cotton. It is necessary, moreover, to reckon with the fact that cotton colors comprise a larger range of separate groups, some of which are not used in dyeing wool, and also that the analytical scheme must be applicable both to dyed colors and to those applied by printing. The problem thus presented is therefore, a more complicated and difficult one than the detection of colors on wool, and the author has found it necessary to employ a rather different system, though still retaining the same general principles. In presenting this scheme the author lays no claim to perfection, but on the contrary is well aware that in many particulars it is open to improvement. At the same time the author has felt that even if subsequent modification is necessary, it may at least serve as a basis for future work. Owing to the often great individual variations in the properties of dyestuffs belonging to the same group, and also to the fact that many dyestuffs occupy a more or less intermediate position between two groups both in relation to chemical structure and to behavior, it is scarcely possible that a perfect scheme of analysis could be found. A considerable amount of skill and experience in carrying out the tests must always be required of the operator as a necessary condition of success.

In the development of the scheme here presented the following points have required special attention. Firstly, in order to overcome the difficulty introduced by the presence of a tannin mordant, the author has been constrained to remove the latter by boiling with caustic soda; and to prevent this reagent from stripping the dyestuff at the same time, the author saturated it with common salt. The basic dyestuffs are thus left on the fibre in the form of free color-bases which can then be readily stripped by boiling with dilute acetic acid, or preferably with dilute formic acid. Although most other colors are unaffected by boiling with the "saline caustic soda," as the above reagent is termed, some mordant dyes, such as Turkey Red, are partially

decomposed. In such a case the acetic or formic acid extract will usually not have the color of the dyed material, but in order to avoid any possibility of error from this cause, the author prefers, if the color is appreciably stripped, to add to the acid extract a solution of tannin, when a colored precipitate will result if a basic dyestuff is present.

As already mentioned, many basic dyestuffs fixed upon a tannin mordant do not give the leuco compound upon reduction with hydrosulphite, or if the leuco compound is formed, it may pass into solution and thus render reoxidation on the fibre impossible. To overcome this difficulty the author has found it best (in the case of basic colors) to transfer the dyestuff to wool, and perform the tests with hydrosulphite and persulphate on this fibre instead of upon the original cotton. The transference of a basic color from cotton to wool is very readily and quickly accomplished after the removal of the tannin mordant (see method later). This procedure affords the further advantage that in the case of pale shades the color can be concentrated from a large piece of cotton onto a small piece of wool and the tests thus rendered more distinct. Moreover, if the color is a mixture, an opportunity is possibly offered of effecting a separation, since the different components will probably vary in their relative affinity for the two fibres.

Transference to wool before applying the hydrosulphite and oxidation tests has also been adopted in the case of acid colors.

A class of dyestuffs which occupy a somewhat intermediate position between the basic colors and the mordant colors, since they contain the characteristic grouping of both classes, are the dyestuffs of the Gallocyanine series and the Chrome colors of the Rosaniline series. These products, when treated with saline caustic soda followed by dilute formic acid, behave like basic dyestuffs, except that they are less completely extracted. The acid extracts, though precipitated by tannin, give a finer and less distinct precipitate. As a means of distinction from ordinary

basic dyestuffs, use is made of the fact that they cannot be transferred by the methods applicable in other cases.

With dyestuffs not belonging to the acid or basic class, the reduction and oxidation tests must be performed on the cotton fibre itself and the author prefers applying these tests before further subdivision. Considerable difficulty was encountered at the outset in applying the hydrosulphite reagent on account of the considerable resistance which many azo colors oppose to reduction, especially the azo compounds formed on the fibre. This difficulty has now been completely overcome by making use of the fact, which has recently become known, that the reducing power of hydrosulphites is greatly increased by the presence of very small quantities of certain coloring matters or other reducible substances. The compounds which exert this effect in the most marked degree are Induline Scarlet, Alizarine and Anthraquinone. Of these the latter has proved the most suitable for our purpose, since it does not stain the cotton, and when added to the hydrosulphite solution in small quantity gives a reagent (termed " Hydrosulphite X ") which readily effects complete reduction in all cases.

The author has been unable to devise any certain method of distinguishing between the Salt colors which are applied by direct dyeing and those which have been subsequently fixed by development, by coupling with diazo compounds, or by treatment with formaldehyde, etc. In all these cases white cotton is stained more or less when boiled with dyed material in a soap or sodium carbonate solution, and though the degree of staining is often much less with the developed or fixed colors than with the undeveloped dyeings, and may after some practice be relied on as a means of differentiation in special cases, *e.g.*, for Blacks, no absolute method can be based upon it. It is also obvious that since such developed colors do not differ chemically from the dyestuffs of the same composition prepared in substance and applied afterwards, no method of distinguishing between them by a chemical test can be expected. The difficulty is still further increased by

the very large number of individual coloring matters which the the group of Salt dyestuffs now comprises.

For the identification of Sulphide colors the authors employ, in the absence of a better method, the well-known test with stannous chloride. This is carried out in the manner described by Green and Stephens. The indications of this test require it to be accepted with some caution, as there are several possibilities of error. Some of these have already been indicated in the note referred to, while Mr. Hollenweger has since kindly directed our attention to the fact that also many Salt dyestuffs evolve hydric sulphide when boiled with stannous chloride, apparently through reduction of sulphonic groups. It therefore becomes necessary in any analytical scheme to exclude the presence of Salt colors before employing this test for Sulphide dyestuffs.

In the tables which follow later there is given under each division a list of the chief dyestuffs it includes. Owing to the exigencies of space, and the large number of dyestuffs on the market, these lists can only be regarded as a guide, and in no sense as being a complete enumeration of all the coloring matters in the respective groups.

REAGENTS.

The following reagents are employed. It is important that they be used of the strength indicated:

WEAK AMMONIA (1:1000)

1 c.c. strong ammonia
100 c.c. distilled water.

DILUTE CAUSTIC SODA

10 g. caustic soda
100 c.c. water.

SALINE CAUSTIC SODA

10 c.c. caustic soda solution (35 to 40 per cent. $NaOH$)
100 c.c. saturated solution of salt.

FORMIC ACID (90 PER CENT.)

Ordinary commercial strength.

WEAK FORMIC ACID (1: 100)

1 c.c. formic acid (90 per cent.)
100 c.c. distilled water.

DILUTE HYDROCHLORIC ACID (: 20)

5 c.c. hydrochloric acid (30 per cent.)
100 c.c. water.

SOAP SOLUTION

10 g. soap in 300 c.c. of water.

TANNIN SOLUTION

10 g. tannin
10 g. sodium acetate
100 c.c. of water.

BLEACHING POWDER SOLUTION

Fresh solution at 5° Tw.

HYDROSULPHITE A (SAME AS FOR WOOL)

Ten per cent. solution of Hydrosulphite NF or of Hydraldite, or a 5 per cent. solution of Hydrosulphite N F conc., or of Rongalite (formaldehyde compounds of hydrosulphurous or of sulphoxylic acids).

HYDROSULPHITE B (SAME AS FOR WOOL)

The preceding slightly acidified by addition of 1 c.c. glacial acetic acid to 200 c.c. of solution.

HYDROSULPHITE X.

Dissolve 50 g. of Rongalite or Hydrosulphite NF conc. in 125 c.c. of hot water. Grind 1 g. of anthraquinone (precipitated not sublimed) to a fine powder, and reduce to a smooth paste with a

little of the Rongalite solution. Add this paste to the remaining solution hot, and heat the whole for one or two minutes at about 90° C. Then dilute with cold water to 500 c.c. and after standing till cold add 1½ c.c. of glacial acetic acid. Keep in a well stoppered bottle with greased stopper. The reagent should be tested occasionally by trying its effect on cotton dyed with Alphanaphthylamine Bordeaux, which should be fully discharged after boiling for one or two minutes. The anthraquinone may be replaced by B-oxyanthra quinone, which can be employed in the same way or previously dissolved in a little alcohol before it is added to the hydrosulphite. It has the advantage of giving a clearer solution, but is not so generally available.

PERSULPHATE SOLUTION.

A cold saturated solution of potassium persulphate or a 2 per cent. solution of ammonium persulphate.

ACID STANNOUS CHLORIDE.

100 g. stannous chloride to 100 c.c. hydrochloric acid (30 per cent.) and 50 c.c. water. In testing of desired colors this reagent may be replaced if desired by a strong solution of titanous chloride.

PROCEDURE.

General:—All the reactions are performed in test tubes, usually with pieces of material about ½ inch to ¾ of an inch square, which are covered with from 1½ to 2 inches of the reagent. The degree of stripping is judged by comparing the depth of shade remaining against that of the original pattern; the color of the stripping solution is misleading, and can scarcely be relied upon as a guide. In testing the colors of calico prints the particular shades should be cut out and the reactions tried upon them separately. With cotton and wool or cotton and silk unions the weft is separated from the cotton warp and both submitted to examination. Doubt may frequently exist as to how a particular

shade should be classified, whether, for instance, a reddish-blue is to be regarded as a blue or a violet. In such cases the tables referring to both shades should be employed; since the same general scheme is adopted throughout the tables, this can scarcely give rise to confusion. The same remark applies to possible mixtures; thus in examining a certain green shade, both the yellow and the blue tables may require to be used. To distinguish between individual dyestuffs of the same group, the reactions towards concentrated sulphuric acid, caustic soda, etc., may be employed, as published in the tables of Lange, Gnehm, Herrmann and others. For additional confirmation it is well to compare the sample both as to shade and reactions with a dyed pattern of the coloring matter or coloring matters to which it is believed to correspond.

It is obvious that in many instances the analytical procedure may be greatly simplified by exclusion of dyestuffs. the presence of which is rendered improbable or impossible by the special circumstances of the case, *e.g.*, by the material, shade, or mode of application of the color.

STRIPPING TEST FOR ACID COLORS.

A few salt dyestuffs are partially stripped by weak ammonia, and may thus give rise to the impression that they are acid colors. To avoid this error it is advisable to add a small piece of white cotton when carrying out the test. If the dyestuff is an acid one, the cotton is either not tinted, or becomes white on boiling a second time with weak ammonia.

TRANSFERENCE OF BASIC COLOR TO WOOL.

The tannin mordant is first removed, as in testing for a basic color, by boiling the pattern for half a minute with saline caustic soda. It is then well washed to remove all alkali, and is boiled with a piece of white wool (half the size of the cotton or less) in a little plain water for one or two minutes. In most cases

the dye base will leave the cotton almost entirely, and dye the wool a full shade. If the color does not develop on the wool one or two drops of weak formic acid (1: 100) may be added. In the case of a few dyestuffs which are more difficult to strip (*e.g.*, basic greys) it is necessary to extract the color with dilute hydrochloric acid (1: 20), carefully neutralizing the extract with ammonia before adding the wool.

TRANSFERENCE OF ACID COLORS TO WOOL.

The cotton is simply boiled with a small piece of wool and weak formic acid (1: 100).

TANNIN TEST FOR BASIC COLORS.

Add a few drops of Tannin solution to the formic acid extract. Shake well, and if the precipitate does not form at once allow to stand a few minutes. Some coloring matters, such as the Rhodamines, Gallocyanines and Chrome colors of the Rosaniline series (which contain carboxyl or hydroxyl groups in addition to basic groups) only precipitate slowly, while the precipitate being more finely divided is sometimes difficult to see.

BLEEDING TEST FOR SALT DYESTUFFS.

In testing for salt dyestuffs by the bleeding test, the sample is placed in a test tube together with a smaller piece of white mercerized cotton cloth, and boiled with soap solution for about a minute. The soap solution may also be replaced by a 5 per cent. solution of sodium carbonate.

LEAD ACETATE TEST FOR SULPHIDE COLORS.

The sample is just covered with acid stannous chloride solution. The mouth of the test tube is closed by a cap of filter paper closely wrapped round it, into the centre of which is placed by means of a glass rod one drop of lead acetate solution. The contents of the test tube are slowly heated to the boiling point,

when a blackish-brown stain of lead sulphide appears if a sulphide color is present. The brown spot will again disappear on boiling the solution longer, owing to the decomposition of the lead sulphide by the hydrochloric acid evolved. In order to avoid the possibility of error through extraneous sulphur present on the cotton, the pattern may be previously boiled with 10 per cent. caustic soda. It must, however, be borne in mind that the indications of the sulphide dyestuffs are rendered less sharp by this latter treatment. It is important to pay special attention to the cleanliness of the test tubes employed for this test, as the author has found that tubes which have been previously used for hydrosulphite reductions acquire a thin deposit of sulphur upon their walls, which on boiling with stannous chloride gives rise to hydric sulphide and thus may lead to error.

REDUCTION AND REOXIDATION TESTS.

The reduction with Hydrosulphite X is carried out by boiling the sample with the reagent for from half to two minutes. The azines, thiazines, oxazines, etc., and most of the azo dyestuffs are fully reduced in about half a minute, but the insoluble azo colors and some salt dyestuffs require from one to two minutes to complete their reduction. In testing the reoxidizability by air, the reduced sample should be exposed to the fumes from an ammonia bottle, which in many cases accelerates oxidation.

EXAMINATION OF YELLOW OR ORANGE SHADES. TABLE I.

Boil with weak ammonia (1:100).

A. Much color is stripped.

Boil with acidified water and small piece of white wool.

X. Color is not transferred to the wool. Sn is present in ash. Persian Berries on tin mordant.

Y. Color is transferred to the wool. Acid dyestuff.

Boil with hydrosulphite B.

Not decolorized. Pyrone or Quinoline group: Quinoline Yellow, Eosine Orange.

Permanently decolorized. Azo group. Indian Yellow, Orange IV, G, etc.

B. Color is not stripped.

Boil half minute with saline caustic soda, rinse and boil twice with weak formic acid.

X. The color is completely destroyed, both alkaline and acid solutions and the fibres being colorless.

Treat original fibre with cold ammonium sulphide.

Fibre blackened. Cr present in ash. Chrome Yellow or Chrome Orange.

Fibre not blackened.

Boil with hydrosulphite X.

Decolorized. Flavinduline.

Not decolorized.

Test for Al in ash.

Al present, Alizarine Yellow A.

Al absent, Thioflavine T.

Y. Color is completely or largely stripped, giving a colored acid extract, which is precipitated with Tannin solution: Basic dyestuff.

Transfer to wool and boil with hydrosulphite B.

Wool is permanently decolorized: Azo group. Chrysoidine, Tannin Orange, Janus Yellow, etc.

Wool is not decolorized.

Boil cotton with hydrochloric acid (1:20).

Decolorized, Auramine.

Not decolorized. The conc. H_2SO_4 and alcoholic solutions are fluorescent: Acridine group. Phosphine, Benzoflavin, Acridine Yellow, Acridine Orange, etc.

Z. The color is stripped or the acid extract is not precipitated by tannin solution.

Reduce with hydrosulphite X.

Decolorized and color not restored by air or persulphate: Azo dyestuff: (including Stilbene group).

Boil with soap solution and white mercerized cotton.

White cotton is stained. Salt color.

Test ash for Cr and Cu.

No Cr or Cu present: Salt Azo dyestuff untreated. Chrysophenine, Chrysamine, Toluylene Yellow and Orange, Stilbene Yellows and Oranges, Benzo, Congo, Diamine and Dianil Yellows and Oranges, Pyramine Orange, etc. Cr or Cu present: Salt Azo dyestuff after-treated. The preceding coppered or chromed.

White cotton is not stained.

Boil with pyridine.

The color is stripped: Insoluble colors Metanitraniline Orange or Nitrotoluidine Orange (formed on fibre).

Color is not stripped. Cr present in ash: Azo Mordant Color: Chrome Orange, Alizarine Yellow R, GG, etc., Diamond Flavine, Flavazol, etc.

The color is unaffected or changed in shade (becoming yellower, browner, or bluer).

Apply lead acetate test.

H_2S is evolved. After reduction with Hydrosulphite the original color is rapidly restored by air: Sulphide dyestuff. Immedial, Katigene, Pyrogene, Thiogene, Sulphur, etc., Yellow and Oranges.

No H_2S is evolved.

Boil with soap solution and white mercerized cotton.

The white cotton is stained: Thiazol Salt dyestuff.

The color after reduction with Hydrosulphite can be

diazotized and developed red with betanaphthol. Primuline developed with Phenol or with Resorcinol. Cotton Yellow G and R, Oriol Yellow, Dianil Yellow, etc.

The color after reduction cannot be diazotized and developed. Chlorophenine, Chloramine Yellow, Diamine Fast Yellow B, FF, and C, Clayton Yellow, Thioflavine S, etc. Primuline developed with Hypochlorite.

The white cotton is not stained: Mordant or Vat dyestuff.

The reduced color is yellow or brownish yellow. Al or Cr in ash. Persian Berries on Al or Cr mordant.

The reduced color is brown, restored to orange by persulphate. Alizarine Orange on Al mordant.

The reduced color is blue, restored to yellow on exposure to air. Flavanthrene.

NOTE 1.—Brilliant Yellow is largely stripped by weak ammonia but if white cotton is present it is stained.

NOTE 2.—Sulphide Yellows of the thiazol class such as Katigene Yellow ZG, Pyrogene Yellow, etc., stain white cotton slightly when boiled in soap.

NOTE 3.—Diamond Flavine if not fully fixed may stain cotton from a soap solution.

RED COLORS. TABLE II.

Boil with weak ammonia (1:100).

A. The color is stripped: Acid dyestuff.

Transfer to wool and boil with hydrosulphite B.

Not decolorized: Pyrone group. Eosines, Phloxines, Rose Bengal, etc.

Decolorized. Color not restored by air or persulphate: Azo group. Crocein Scarlets, Brilliant Croceines. Fast Reds, etc.

B. The color is not stripped.

Boil for half minute with saline caustic soda, rinse and boil twice for one minute with formic acid (1:100).

Y. The color is completely or largely stripped, giving a colored acid extract, which is precipitated by Tannin solution:

Basic dyestuff (on tannin or other mordant).

Transfer to wool and boil with hydrosulphite A.

Wool not decolorized: Pyrone group. Rhodamines, Rhodines, Irisamine, Acridine Reds, etc.

Wool decolorized. Color returns on exposure to air, but is restored by persulphate: Triphenylmethane group. Magenta, Fuchsine, Isorubine, Cerise, Grenadine, etc.

Wool decolorized. Color not restored by air or by persulphate: Azo group, Janus Red.

Z. The color is not stripped or the acid extract is not precipitated by tannin solution.

Reduce with hydrosulphite X.

Color changed to greenish-yellow which can be diazotized and developed with betanaphthol: Primuline Azo group. Primuline developed with Betanaphthol or with R-salt.

Color unaffected or changed in shade (becomes browner, etc.). Anthracene group.

Boil with 90 per cent. formic acid.

Color is stripped.

Test ash for mordant.

Al present. Turkey Red, Alizarine Red, Alizarine Pink, Alizarine Maroon.

Color not much affected.

Test ash for Cr.

Cr present. Alizarine, Purpurines or Alizarine Maroon on Cr. mordant.

Decolorized. Color returns on exposure to air: Azine or Indigo group.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Thiogene Rubine, etc. No H_2S is evolved. Red vapors formed on heating fibre in dry test-tube. Thio Indigo Red, Thio Indigo Scarlet.

Decolorized and color not restored by air or by persulphate: Azo group.

Boil with soap solution and white mercerized cotton.

The white cotton is stained: Salt dyestuff.

Test ash for Cr and Cu.

No Cr. or Cu present: Azo Salt dyestuff. Benzo Purpurine, Diamine Scarlets, Diamine Reds, Benzo Fast Scarlets, Diazo Brilliant Scarlet, Rosanthrenes, Zambesi Red, Erica, Diamine Rose, Geranine, Rosophenine, etc. Cr or Cu present: Azo Salt dyestuff after-treated. Diamine Fast Red F, etc.

The white cotton is not stained:

Boil with pyridine.

The color is stripped: Insoluble Azo color. Paranitraniline Red, Alpha Naphthylamine Bordeaux, Chloranisidine Pink, Nitroanisidine Pink.

The color is not stripped: Cr in ash: Mordant Azo dyestuff. Chrome Red, Brilliant Chrome Red, Chrome Bordeaux.

NOTE.—Janus Claret Red B does not easily transfer to wool.

TABLE III.—PURPLE AND VIOLET COLORS.

Boil with weak ammonia (1 : 100).

A. The color is stripped: Acid dyestuff. The color transferred to wool is decolorized by Hydrosulphite A and restored by persulphate: Triphenylmethane group.

The ammoniacal solution is colorless but becomes blue on acidifying. Alkali or Soluble Blues.

The ammoniacal solution is violet. Acid Violets, Formyl Violets.

B. The color is not stripped.

Boil for half minute with saline caustic soda, rinse, and boil twice for one minute with weak formic acid (1:100).

Y. The color is completely or largely stripped giving a colored extract, which is precipitated by Tannin solutions: Basic dyestuff (on tannin or other mordant) or Basic mordant dyestuff.

Boil with saline caustic soda, rinse well, and boil with small piece of white wool and plain water.

The wool is dyed: Basic dyestuff.

Boil wool with hydrosulphite A.

Not decolorized: Pyrone group. Anisoline.

Decolorized. Color returns on exposure to air: Azine (oxazine or thiazine) group. Methylene Violets, Rhoduline Violet, Iris Violet, Neutral Violet, Tannin Heliotrope, etc.

Decolorized. Color does not return in air, but is restored by persulphate: Triphenylmethane group. Methyl Violets, Ethyl Violet, Benzyl Violet, Crystal Violet, etc. Decolorized. Color is not restored by air or persulphate: Azo group. Janus Claret Red, etc.

The wool is not dyed. Cr is present in ash: Basic Mordant dyestuff.

Boil cotton with hydrosulphite X.

Decolorized. Color returns on exposure to air: Oxazine group. Gallocyanine, Gallamine Blue, Prune, etc.

Decolorized only slowly. Color does not return

in air, but is restored by persulphate; Triphenylmethane group. Chrome Violet.

Z. The color is not stripped or the acid extract is not precipitated by Tannin solution.

Reduce with hydrosulphite X.

Decolorized. Color is restored on exposure to air: Azine, Oxazine or Thiazine group.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Thiogene Violet, Katigene Violet, etc.

No H_2S is evolved. Cr is present in ash: Mordant Oxazine dyestuff (not falling in group 7) Galleine Blue, Gallocyanine, etc.

Decolorized and color not restored by air or persulphate: Azo group or Alizarine on iron (decolorized slowly).

Boil with soap solution and white mercerized cotton.

The white cotton is stained: Salt dyestuff.

Test ash for Cr or Cu.

No Cr or Cu present: Azo Salt dyestuff. Violets of the Diamine, Benzo, Congo, Hessian, Columbia, Chlorazol, Chlorantine, Dianil, Oxamine, and Rosanthrene series.

Cr or Cu present: Azo Salt dyestuff after-treated. The preceding coppered or chromed.

The white cotton is not stained.

Boil with hydrochloric acid (1:20).

Color destroyed giving yellow solution. Fe present in ash: Alizarine on Fe mordant. Alizarine Purple.

The color is not stripped.

Boil with pyridine.

The color is stripped: Insoluble Azo Color. Benzidine Blue.

The color is not stripped: Cr present in ash:

Mordant Azo dyestuff. Chrome Bordeaux, Chrome Bordeaux, etc. The color is unaffected or changed in shade: Pyrone or Anthracene group (also one or two Sulphide dyestuffs.) The color is unaffected. Al or Cr present in ash: Pyrone or Anthracene Mordant Color. Galleine, Alizarine Violet, Alizarine Claret, Alizarine Cyclamine, Alizarine on Cr mordant.

The color is changed to brown.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Thiogene Dark Red, etc.

No H_2S is evolved.

Test ash for A1 and Cr.

Al or Cr present: Anthracene Mordant dyestuff. Alizarine Cyanine 3R, Alizarine Bordeaux.

Al and Cr absent. Anthracene Vat dyestuff. Violanthrene.

NOTE.—Alizarine on Chromium becomes rather browner on reduction with Hydrosulphite X.

BLUE COLORS. TABLE IV.

Boil with weak ammonia (1:100).

A. The color is stripped: Acid dyestuff (or Prussian Blue).

The extract is colorless, but becomes blue on acidification. Transferred to wool, the blue is decolorized by Hydrosulphite A, and restored by persulphate: Triphenylmethane group. Alkali or Soluble Blues.

The extract is colorless and remains so on acidification. $FeCl_3$ gives a blue precipitate. Prussian Blue.

B. The color is not stripped.

Boil for half minute with saline caustic soda, rinse, and boil twice with weak formic acid (1:100).

Y. The color is completely stripped, giving a colored acid extract, which is precipitated by tannin solution: Basic dyestuff (on tannin or other mordant or Basic Mordant dyestuff.

Boil with saline caustic soda, rinse well, and boil with small piece of white wool and plain water.

The wool is dyed: Basic dyestuff.

Boil wool with hydrosulphite A.

Decolorized. Color returns on exposure to air: Azine, Oxazine, or Thiazine group. Methylene Blue, New Methylene Blue, Nile Blue, Capri Blue, Indazine, Basle Blue, Metaphenylene Blue, Meldola's Blue, Fast Blue, Cresyl Blue, Nitroso Blue, Rhoduline Blue, etc. Color changes to red just before being decolorized. Color returns violet or blue: Safranine Azo dyestuff. Indoine Blue, Janus Blue, Naphthindone Blue, Diazine Blue, etc. Decolorized. Color does not return on exposure to air, but restored by persulphate: Triphenylmethane group. Victoria Blue, Night Blue, Turquoise Blue, Setocyanine, etc.

The wool is not dyed. Cr present in ash: Basic Mordant dyestuff.

Boil cotton with hydrosulphite X.

Decolorized. Color returns on exposure to air: Oxazine group. Gallocyanine, Celestine Blue, Prune, etc.

Decolorized slowly. Color restored only by persulphate: Triphenylmethane group. Chrome Blue.

Z. The color is not stripped or the acid extract is not precipitated by Tannin solution.

Reduce with hydrosulphite X.

Color changed to greenish yellow, which can be diazotized and developed red with betanaphthol:

Primuline Azo color. Primuline developed with Naphthylamine ether. Decolorized and color not restored by air or persulphate: Azo group.

Boil with soap solution and white mercerized cotton.

The white cotton is stained: Salt dyestuff.

Test ash for Cr and Cu.

No Cr or Cu present: Azo Salt dyestuff. Blues of the Diamine, Benzo, Congo, Columbia, Chlorazol, Dianil, Oxamine, Chicago, etc., series.

Cr or Cu present: Azo Salt dyestuff after-treated. The preceding Coppered or Chromed.

The white cotton is not stained. Color is stripped by boiling pyridine: Insoluble Azo color. Dianisidine Blue.

Decolorized. Color is restored on exposure to air: Azone Oxazine, Thiazine or Indigo group.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Blues of the Immedial, Katigene, Thiogene, Pyrogene, Sulphur, etc., series.

No H_2S is evolved:

Heat fibre carefully in dry test-tube.

Violet vapors evolved. Indigo.

No colored vapor. Cr in ash: Mordant Thiazine or Oxazine (not falling in group 6). Brilliant Alizarine Blue, Delphine Blue, Gallophenine, etc.

Color unaffected or changed in shade (becoming darker, browner, etc.): Anthracene Mordant or Anthracene Vat dyestuff (also Ultramarine).

Boil with 90 per cent. formic acid.

The color is stripped. Al in ash.

Apply lead acetate test.

H_2S evolved. Ultramarine.

No H_2S evolved: Aliarine dyestuff on Al. Alizarine Cyanines or Anthracene Blues on Al mordant.

The color is not much affected.

Test ash for Cr.

Cr present in ash: Alizarine dyestuff on Cr. Alizarine Blue, Alizarine Cyanines or Anthracene Blues on Cr mordant.

Cr absent: Anthracene Vat dyestuff: Indanthrene, Cyananthrol.

NOTE.—Alkali Blue dyed on tannin and tin mordant is only partly stripped by weak ammonia, the solution being colorless.

GREEN COLORS. TABLE V.

Boil with weak ammonia (1:100).

A. The color is stripped: Acid dyestuff. The color transferred to wool is decolorized by Hydrosulphite A and restored by persulphate: Triphenylmethane group. Acid Greens.

B. The color is not stripped.

Boil for half minute with saline caustic soda, rinse, and boil twice with weak formic acid (1:100).

Y. The color is completely or largely stripped, giving a colored acid extract, which is precipitated by tannin solution: Basic dyestuff (on tannin or other mordant) or Basic Mordant dyestuff.

Boil with saline caustic soda, rinse well, and boil with white wool and plain water.

The wool is not dyed. Cr in ash. Cotton decolorized by Hydrosulphite X, the color not returning in air but restored by persulphate: Triphenylmethane group. Chrome Green.

The wool is dyed: Basic dyestuff.

Boil wool with hydrosulphite A.

Decolorized. Color returns in exposure to air: Azine Oxazine, or Thiazine group. Fast Green M. Methylene Green, Azine Green, Capri Green, etc.

Color becomes red just before being decolorized. Color returns violet or green on exposure to air: Safranine Azo group. Janus Green, Diazine Green, etc. Decolorized. Color does not return on exposure to air, but is restored by persulphate: Triphenylmethane group. Brilliant Green, Malachite Green, Methyl Green, Victoria Green, Setoglaucine, etc.

Z. The color is not stripped or the acid extract is not precipitated by Tannin solution.

Reduce with hydrosulphite X.

The color is changed to greenish yelow which can be diazotized and developed with betanaphthol: Primuline Azo group: Primuline developed with Amidodiphenylamine.

Decolorized and color not restored by air or persulphate: Azo or Nitroso group.

Boil with soap solution and white mercerized cotton.

The cotton is stained: Salt dyestuff.

Test ash for Cr and Cu.

Cr and Cu absent: Azo Salt dyestuff. Diamine Green, Benzo Green, Columbia Green, Chloramine Green, etc.

Cr or Cu present: Azo Salt dyestuff after-treated.

The cotton is not stained.

Boil with hydrochloric acid (1:20).

Color destroyed. Fe is present in the ash: Nitroso group. Russian Green, Steam Green, Fast Green O, Alsace Green, Gambines, Dixioxine, etc.

Not decolorized. Cr is present in the ash: Mordant Azo dyestuff. Diamond Green.

Decolorized. Color returns on exposure to air: Azine Oxazine, or Thiazine group.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Greens of the Immedial, Katigene, Thiogene, Pyrogene, Sulphue, and Thionol Series.

No H_2S is evolved: Mordant Oxazine (or Thiazine). Gallanic Green, Indalizarine, etc.

The color is unaffected or changed to red, brown, blue, etc.

Test ash for Cr and Ni.

No Cr or Ni present in ash: Anthracene Vat dyestuff.

Reduced color is brownish olive. H_2S evolved on applying lead acetate test. Olivanthrene. Reduced color is dark Maroon. Green shade restored by air. Viridanthrene.

Reduced color is blue. Green shade restored by air. Algole Green, Indanthrene in admixture with Flavanthrene.

The ash contains Cr and Ni: Anthracene Mordant dyestuff.

Reduced color is brownish red. Green restored by persulphate but not by air. Boiling HCl (1: 20) gives bright green solution. Alizarine Viridine, Brilliant Alizarine Viridine.

Reduced color is brown. Green shade returns on exposure to air.

Boil with hydrochloric acid (1: 20).

Color unaffected. Solution colorless. Cr in ash. Alizarine Green S on Cr mordant.

Color of fibre becomes grey, solution red. Ni in ash. Alizarine Green S on Mg mordant.

Color of fibre rather paler, solution brownish yellow. Coerulene, Anthracene Green.

Note.—Greens of the nitroso group (Gambines, etc.) may become black on reduction if the Hydrosulphite X is insufficiently acid (formation of FeS).

BROWN COLORS. TABLE VI.

Boil with weak ammonia (1:100).

A. The color is stripped: Acid dyestuff. Transferred to wool it is permanently decolorized by Hydrosulphite A: Azo group. Fast Brown, Naphthylamine Brown, Acid Brown, etc.

B. The color is not stripped.

Boil for half minute with saline caustic soda, rinse and boil twice with weak formic acid (1:100).

Y. The color is stripped giving acid extract which is precipitated by tannin solution: Basic dyestuff. The dyestuff transferred to wool is permanently decolorized by Hydrosulphite A: Azo group. Bismarck Brown, Janus Brown, etc.

Z. The color is not stripped or the acid extract not precipitated by tannin solution.

Reduce with hydrosulphite X.

The shade is changed to greenish yellow which can be diazotized and developed red with betanaphthol: Primuline Azo Color. Primuline developed with Metaphenylene. Terra-Cotta, etc.

Decolorized and color not restored on exposure to air or by persulphate: Azo group and Mineral Colors.

Boil with solution and white mercerized cotton.

The white cotton is stained: Salt dyestuff.

Test ash for Cr and Cu.

Cr and Cu absent: Azo Salt dyestuff. Browns of the Diamine, Benzo, Congo, Dianil, Columbia, Hessian, Oxamine and Toluylene series.

Cr and Cu present. Azo Salt dyestuff after-treated. The preceding coppered or chromed.

The white cotton is not stained.

Boil with pyridine.

The color is stripped: Insoluble Azo Color.

Test ash for Cu.

Cu absent. Para Brown (Chrysoidine and Paranitraniline), Benzidine or Tolidine Brown.

Cu present. Paranitraniline Cutch (Para Red Coppered).

The color is not stripped: Mineral color.

Treat with sodium bisulphite in the cold.

Decolorized. Manganese Bronze.

Nor decolorized. Iron Buff, Khaki (Oxides of Cr and Fe).

Unaltered or changed in shade, becoming darker, paler, yellower, etc.

Apply lead acetate test.

H_2S is evolved: Sulphide dyestuff. Immedial Cutch, Cross Dye Brown, Katigene Browns, Thiogene Browns, etc.

H_2S is evolved.

Test ash for Cr and Cu.

Cr or Cu (or both) present: Mordant dyestuff.

Boil with HCl (1:20).

Completely stripped. Anthragallol, Anthracene Brown, Alizarine Brown.

Not stripped or only slightly.

Boil with dilute caustic soda 10 per cent.

Fibre and solution dull violet. Alizarine Orange on Cr Mordant, Alizarine or Purpurine on Cu.

Solution brown, fibre unaffected. Cutch.

Cr and Cu absent: Anthracene Vat dyestuff, etc. Fuscanthrene, Paramine Brown (p-Phenylene Diamine oxidized on Fibre.)

NOTE.—Iron Buff and Khaki may become black on reduction if Hydrosulphite X is insufficiently acid (formation of FeS).

BLACK AND GREY COLORS. TABLE VII.

Boil with weak ammonia (1:100).

A. The color is stripped: Acid dyestuff. The dyestuff transferred to wool and boiled with Hydrosulphite A is permanently decolorized: Azo group. Naphthol Blacks, Naphthylamine Blacks, Palatine Black, etc.

B. The color is not stripped.

Boil with dilute hydrochloric acid (1:20).

Y. The color is stripped.

Fibre and solution colorless. Tannate of Iron.
Solution orange. Fe in ash. Logwood Black on Iron Mordant.

Solution Red. Cr in ash. Logwood Black on Chrome Mordant, Noir Reduit.

Z. The color is not stripped (or only slightly).

Boil for one half minute with saline caustic soda, rinse and boil with dilute hydrochloric acid (1:20).

The color is largely stripped and the acid extract is precipitated by tannin solution: Basic dyestuff.

Transfer to wool (see note) and boil with Hydrosulphite A.

Decolorized. Color returns on exposure to air: Azine, Oxazine, or Thiazine Group. Methylene Grey, New Methylene Grey, New Fast Grey, Nigrosine, etc.

Color becomes red just before being decolorized. Violet or violet blue color returns in air: Saffranine Azo group. Janus Black, Janus Grey, Diazine Grey.

The color is stripped or acid extract is not precipitated by tannin solution.

Reduce with hydrosulphite X.

Decolorized and color not restored by air or persulphate: Azo group.

Boil with soap solution and white mercerized cotton.

The white cotton is not stained. Color is stripped by boiling pyridine: Insoluble Azo color. Azophor Black. The white cotton is stained.

Test ash for Cr and Cu.

Cr and Cu absent: Azo Salt dyestuff. Blacks of the Diamine, Oxydiamine, Benzo, Columbia, Dianil, Pluto, etc., series. Also Diaminogen, Diazo Blacks, etc. (developed or coupled).

Cr or Cu present: Azo Salt dyestuff after-treated. The preceding coppered or chromed.

The color is unaffected or changed in shade (becoming brown, maroon, etc.)

The reduced color is brown. Only slowly and imperfectly restored to black by air but at once by persulphate: Cr present in ash: Naphthalene Mordant dyestuff. Naphthalizarine S, Alizarine Black S, Alizarine Blue Black, SW, Naphthomelane. Color not changed by reduction (or very slightly):

Test ash for Cr.

Anthracene group.

Cr present: Anthracene Mordant dyestuff. Alizarine, Cyanine Black, Alizarine Blue Black B.

Cr absent: Anthracene Vat dyestuff. Melanthrene.

The reduced color is brown but is rapidly restored to black on exposure to air: Azine, Oxazine, or Thiazine group.

Apply lead acetate test.

H_2S is evolved. Fibre becomes colorless or pale buff on boiling with bleaching powder solution 5° Tw.: Sulphide dyestuff. Blacks of the Immedial, Katigene, Cross Dye, Pyrogene, Thiogene, Thionol, Pyrol, Sulphur, etc., Series.

The H_2S is evolved. Fibre becomes reddish brown on boiling with bleaching powder 5° Tw.: An Oxidation Black. Aged Aniline Black, Prussiate Black, One Bath Aniline Black, Steam Aniline Black. Diphenyl Black, Amido Fast Black.

NOTE.—Chrome Black (By) becomes light brown on reduction with Hydrosulphite X and persulphates change the color to dark brown but not to black.

This paper which is taken from the Journal of the Society of Dyers and Colorists is the application of the author's scheme of analysis to vegetable fibres, that for animal fibres being published in Year Book, vol. viii. It has again been necessary to change the form of the tables but the matter follows the original exactly.

PART III

Patents for the Year 1907

I. DYESTUFFS AND COLORING-MATTERS
II. PROCESSES OF APPLICATION
III. CHEMICAL PROCESSES
IV. MACHINES
V. MISCELLANEOUS

Patents for the Year 1907

I.—DYESTUFFS AND COLORING-MATTERS.

YELLOW-RED DYE AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 841,003, dated January 8, 1907.

In U. S. Patent No. 831,844 is described the manufacture of a bluish-red dyestuff, dyeing in the vat like indigo, by heating salicylthioacetic acid,

$$C_6H_4\left\langle\begin{array}{ll} S\text{-}CH_2.COOH & (1) \\ COOH & (2) \end{array}\right.$$

in presence of aromatic nitro-hydrocarbons—such as, for example, nitrobenzene—at high temperatures. The dyestuff thus obtained dyes cotton without a mordant in an alkaline hydrosulphite vat bluish-red clear tints.

It is now found that dyestuffs of the same character, but a dyeing yellower-red tints, may be obtained by heating salicylthioacetic acid with a nitro-hydrocarbon and an isatin compound—as, for example, isatin, its homologues, and its substitution products. When the mass produced by the reaction is cooled, the new dyestuffs crystallize in the form of brilliant yellowish-red to brownish-red well-formed needles.

AZO DYE AND PROCESS OF MAKING SAME.

Melchior Böniger, of Basel, Switzerland, assignor to corporation of Chemical Works formerly Sandoz. Patent No. 841,371, dated January 15, 1907.

This invention relates to the manufacture of new monoazo dyes suitable for subsequent chroming or treatment with bluestone by the action of orthodiazophenol compounds on aryl 1.8 naphthylamine sulphonic acids. The direct dyeings of these dyestuffs on wool in an acid-bath vary from blue-red to dark violet and are transformed by subsequent treatment with bichromate or blue-stone into very valuable dark blue, blue-black, and deep-black shades of excellent fastness to light and milling. The best results have been obtained by employing for the combination with aryl 1.8 naphthylamine sulphonic acids the diazo compounds of monoand dichloro-ortho-amidophenol, mono- and dinitro-ortho-amidophenols, chloro-nitro-ortho-amidophenols, nitro-ortho-amido-cresols, ortho-amidophenol sulphonic acids, their homologues and substitution products.

BLUE SULPHUR DYE AND PROCESS OF MAKING SAME.

August Leopold Laska and Georg List, of Offenbach-on-the-Main, Germany, assignors to Chemische Fabrik Griesheim Elecktron. Patent No. 841,877, dated January 22, 1907.

The inventors claim that by heating monoalkylpara 1-amido-meta 1 chlor-para-oxydiphenylamines with alkaline polysulphides under certain conditions blue dyestuffs of great technical value and very bright shade are obtained. These dyestuffs are very fast to washing and contain no chlorine. The diphenylamine derivatives may be obtained by the joint oxidation of para amidophenol and orthochlormonoalkylaniline in equimolecular proportions and reduction of this oxidation product.

Patents for the Year 1907

RED TETRAZO DYE.

Hugo Witter, of Leverkusen, near Cologne, Germany, assignor to Farbenfabriken, vorm. Friedr. Bayer & Co. Patent No. 832,048, dated January 22, 1907.

This invention relates to the preparation of a new tetrazo dyestuff which is obtained by combining one molecule of the tetrazo compound of benzidin with one molecule of 2-naphthylamin-3.6-disulphonic acid and (in acid solution) with one molecule of 2-amino-8-naphthol-6-sulphonic acid, or vice versa. The dye thus obtained dyes cotton bluish-red shades remarkable for good fastness to light.

LEUCO PRODUCTS FROM GALLIC COMPOUNDS AND ALKYL-DIAMIDO-ARYLTHIOSULPHONIC ACIDS, &c.

Charles De La Harpe and Rudolf Burckhardt, of Basel, Switzerland, assignors to Dye-works formerly L. Durand, Huguenin Co. Patent No. 842,303, dated January 29, 1907.

The inventors have found that new compounds very valuable for dyeing and printing are obtained when alkyl-diamido-arylthiosulphonic acids are caused to react with gallic compounds—as, for instance, gallamic acid, gallic acid, methyl gallate, or gallanilide in water, alcohol, or another suitable medium in presence of alkali and with exclusion of air. The condensation occurs gradually with elimination of sulphurous acid as a sulphite and with formation of a leuco compound which may easily be oxidized in air; but its hydrochloride and other salts are not changed by air. These new leuco compounds constitute in dry state and in the form of salts greenish powders solubl in sulphuric acid with a red coloration, becoming violet-black on addition of an oxidizing agent, and yield by oxidation on chromium-mordanted fibers blue-violet shades fast to light and washing.

AZO DYE AND PROCESS OF MAKING SAME.

Wilhelm Herzberg, of Berlin, Germany, assignor to Actien Gesellschaft für Anilin Fabrikation. Patent No. 842,548, dated January 29, 1907.

The present invention relates to the manufacture of a new dyestuff made by diazotizing and then combining di-ortho-dianisidine-disulphonic acid with beta-naphthol which is a red azo dye of great technical value, yielding when dyed on wool in an acid-bath a clear bluish-red shade, and the dye thus obtained being fast to washing and acid or alkaline milling.

As to the production of the di-ortho-dianisidindisulphonic acid, which is to be diazotized and then combined with beta-naphthol, according to this invention, it may be prepared by the action of fuming sulphuric acid on diortho-dianisidine at temperatures between 0° and about 30° C. The neutral sodium salt of this new sulphonic acid is obtained in the shape of small leaves of a silvery luster, containing water of crystallization by cooling a hot concentrated aqueous solution of this salt, as it dissolves in about ten times its weight of hot water, but is difficultly soluble in cold water, whereas the free disulphonic acid is very easily soluble in water. This new sulphonic acid most probably has the following constitution:

$$\begin{array}{llcll}
(2) & HO_3S\diagdown & & \diagup SO_3H & (2) \\
(4) & H_2N - & C_6H_2 - C_6H_2 & - NH_2 & (4) \\
(5) & CH_3O\diagup & (1) & \diagdown OCH_3 & (5)
\end{array}$$

Instead of the di-ortho-dianisidine-disulphonic acid in the foregoing example another di-ortho-dialkyloxybenzidine-disulphonic acid may be used—as, for instance, di-ortho-diphenetidine-disulphonic acid and a red azo dyestuff dyeing wool without a mordant from an acid-bath clear red tints, which are fast to washing and milling will result.

Patents for the Year 1907

ORANGE LAKE AND PROCESS OF MAKING SAME.

Richard Kirchhoff, of Berlin, Germany, assignor to Actien Gesellschaft für Anilin Fabrikation. Patent No. 842,560, dated January 29, 1907.

The inventor has discovered that valuable orange-color lakes can be obtained from those mono-azo colors which are produced by combining in the usual manner the diazo compound of an amido-sulphonic acid of the benzene or naphthalene series with ortho-nitrophenol by converting the alkali salts of such an azo color into the salts of an alkaline-earth metal, of an earth metal, or of an other suitable metal. For this purpose the alkali salts of the said dyestuffs are dissolved or suspended in water, and a solution of such a metallic salt—as, for instance, a salt of barium, calcium, strontium, magnesium, or the oxide or hydroxide of one of these metals or a mixture of such compounds—is added either in the cold or while heating. It is preferable to add before or after precipitation a suitable substratum, such as sulphate of calcium, hydroxide of aluminium, or the like. The lakes are then filtered and dried. They possess a clear orange color and are most difficultly soluble or nearly insoluble in water. They also are distinguished by a very great fastness to light.

The coloring-matters which are suitable for the purpose are the following: sulphanilic acid-azo-ortho-nitrophenol, metanilic acid-azo-ortho-nitrophenol, chloraniline sulphonic acid-azo-ortho-nitrophenol, 2.6-naphthylamine sulphonic acid-azo-ortho-nitrophenol.

AZO DYE.

Oscar Dressel and Myrtil Kahn, of Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 843,077, dated February 5, 1907.

This invention relates to the manufacture and production of new azo dyestuffs prepared from the hitherto unknown 5-nitro-4-chloro-2-aminophenol and sulphonic acids of naphtholic com-

pounds, such as sulphonic acids of naphthols, dioxynaphthalenes, aminoaphthols or their substitution derivatives, or the like.

The 5-nitro-4-chloro-2-aminophenol is obtained by treating with nitrating agents the ethenyl derivative of the 4-chloro-2-aminophenol. The nitro-ethenyl compound thus obtained (M. P. 148°-149° C.) yields on boiling with dilute mineral acids the 5-nitro-4-chloro-2-aminophenol. It can be also obtained by treating the 4-chloro-2-aminophenol itself with nitrating agents. In this case, however, its isomer, the known 6-nitro-4-chloro-2-aminophenol is formed simultaneously with the 5-nitro-4-chloro-2-aminophenol.

The 5-nitro-4-chloro-2-aminophenol forms yellow needles soluble in alcohol. Its combinations yield the following:

Dyestuff from the diazo compound of 5-nitro-4-chloro-2-aminophenol.	Dyes wool when chromed after dyeing.
1. 1-naphthol-4-sulphonic acid	Reddish blue.
2. 1-naphthol-5-sulphonic acid	Greenish blue.
3. 1-naphthol-3.6-disulphonic acid	Dark blue.
4. 2-naphthol-6-sulphonic acid	Reddish blue.
5. 2-naphthol-7-sulphonic acid	Black.
6. 2-naphthol-3.6-disulphonic acid	Reddish blue.
7. 1.8-aminonaphthol-4-sulphonic acid	Green.
8. 1.8-aminonaphthol-3.6-disulphonic acid	Green.
9. 2-amino-5-naphthol-7-sulphonic acid	Blue.
10. 2-phenylamino-5-naphthol-7-sulphonic acid	Blue.
11. 2-amino-8-naphthol-6-sulphonic acid	Reddish blue.
12. 1.8-dioxynaphthalene-4-sulphonic acid	Greenish blue.
13. 1.6-dioxynaphthalene-3-sulphonic acid	Dark blue.
14. 1.8-dioxynaphthalene-3.6-disulphonic acid	Greenish blue.

AZO DYE.

Oscar Dressel and Anton Ossenbeck, of Elberfeld, Germany, assignors to Fabrenfabriken vorm. Friedr. Bayer & Co. Patent No. 843,147, dated February 5, 1907.

The inventors have found that new and valuable azo dyestuffs are obtained by combining the diazo compounds of non-sulphonated nitro-ortho-aminophenolic compounds with 2-arylamino-5-naphthol-7-sulphonic acids.

The new dyestuffs are in the shape of their alkaline salts dark powders soluble in water and dyeing wool from acid-baths generally from red to violet shades, which on chroming change to from blue to black fast shades.

In the following table the properties of some of the new dyestuffs are given:

Dyestuff obtained from—		Dyes wool from acid baths—	Dyes wool when chromed after dyeing—
1) 4-nitro-2-amino-phenol.	+ 2-phenyl-amino-5-naphthol-7-sulphonic acid.	Bordeaux.	Blue-black.
2) 5-nitro-2-amino-phenol.		Bordeaux.	Greenish blue.
3) Picramic acid.		Bordeaux.	Blue.
4) 6-nitro-2-amino-4-cresol.		Bordeaux.	Blue.
5) 4-nitro-2-amino-phenol.	+ 2-paratolyl-amino-5-naphthol-7-sulphonic acid.	Bordeaux.	Blue-black.
6) 4-nitro-6-amino-2-cresol.		Bordeaux.	Violet-black.
7) 5-nitro-2-amino-phenol.	+ 2-ortho-anisylamino-6-naphthol-7-sulphonic acid	Bordeaux.	Greenish blue.
8) 6-nitro-2-amino-4-cresol.		Borkeaux.	Blue.

AZO COLORING-MATTER.

Myrtil Kahn, of Elberfeld, and Richard Kothe, of Vohwinkel, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 843,149, dated February 5, 1907.

The inventors have found that new and valuable azo dyestuffs are obtained by combining the diazo compound of 6-nitro-4-chloro-2-aminophenol with 2-arylamino-5-naphthol-7-sulphonic acids.

The new dyestuffs are in the shape of their alkaline salts dark powders soluble in water with a violet color, and dyeing wool

from acid baths, generally from red to violet shades, which, on chroming, change to from blue to black fast shades.

The claim specifies the azo dyestuff, which can be obtained by combining diazotized 6-nitro-4-chloro-2-aminophenol with 2-phenylamino-5-naphthol-7-sulphonic acid.

GREEN SULPHUR DYE.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 843,156, dated February 5, 1907.

The inventor has found that new green sulphur dyestuffs result by melting in the presence of copper alkaline polysulphides with indophenols, obtained by joint oxidation of paraamidophenol and alpha-naphthylarylsulphamides (as described by O. N. Witt and G. Schmitt, *Berichte der Deutschen Chemischen Gesellschaft*, XXVII, 2370). In place of the indophenols their leuco derivatives obtained by reduction can be used in producing the dyestuffs. The dyestuffs thus obtained are easy soluble in water and notwithstanding extremely fast to washing.

BLACK AZO DYE AND PROCESS OF MAKING SAME.

Karl Hagemann and Otto Stange, of Leverkusen, near Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 843,808, dated February 12, 1907.

It has been discovered that the hitherto unknown 1-arylamino-8-naphthol-sulphonic acids—such as 1-phenylamino-8-naphthol-3-6- or 4-6-disulphonic acid, 1-paraanisylamino-8-naphthol-3-6-disulphonic acid, 1-beta-naphthylamino-8-naphthol-4-sulphonic acid, or the lie—constitute valuable components for the production of azo dyestuffs. These dyestuffs are obtained by combining the 1-arylamino-8-naphthol-sulphonic acids with diazo compounds, such as the diazo derivatives of aniline, paranitraniline, naphthylamine, dichloraniline, anisidine, amidoazobenzene, amidophenols, amidophenol sulphonic acids, or the like.

The above-mentioned 1-arylamino-8-naphthol-sulphonic acids are obtained by heating 1-amino-8-naphthol-sulphonic acids—such as 1-amino-8-naphthol-3-6-, 4-6-, or 3-5-disulphonic acid, 1-amino-8-naphthol-4-sulphonic acid, or the like—with water and aromatic amines or derivatives thereof, such as aniline, toluidine, anisidine, chloroaniline, naphthylamine, or the like. The condensation may also be carried out in the presence of salts of aromatic amines or condensing agents.

The new dyestuffs obtained by the combination of diazo compounds with the 1-arylamino-8-naphthol-sulphonic acids are in the shape of their alakline salts dark powders soluble in water with from a red to blue to black color; and dye wool from acid-baths from violet to blue to black shades.

LEUCO DERIVATIVES OF GALLOCYANINES AND AROMATIC AMINES AND PROCESS OF MAKING SAME.

Herman Lorétan, of Basel, Switzerland, assignor to the firm of Dye works, formerly L. Durand, Huguenin & Co. Patent No. 844,155, dated February 12, 1907.

It is found that the slight solubility of the new dyestuffs derived from the gallocyanines and the aromatic diamines according to U. S. Patent No. 844,156, renders it difficult to apply them in printing, but that their leuco derivatives, which are easily obtained by the action of various chemical reducing agents or by electrolysis, do not present this difficulty. Their leuco derivatives are all, in the form of their salts—hydrochlorides, for example—much more easily soluble than the dyestuffs from which they are derived and may be fixed under better conditions by printing. These leuco derivatives are stable in the form of salts, but are oxidized rapidly in air when in the free state or in presence of alkalies. They dissolve in sulphuric acid to a pale brownish-red solution, which turns dark red on addition of a small quantity of an oxidant, such as manganese dioxide.

GREENISH-BLUE DYE AND PROCESS OF MAKING SAME.

Herman Lorétan, of Basel, Switzerland, assignor to the firm of Dye works formerly L. Durand, Huguenin & Co. Patent No. 844,156, dated February 12, 1907.

The inventor has found that the gallocyanins obtained by the action of nitrosodialkylanilins on gallic acid and its derivatives may be condensed with aromatic diamins which have at least one amido group free, and thus yield new dyestuffs interesting owing to their fastness to fulling and to chlorin. This condensation may be facilitated by the presence of easily- reducible substances, such as nitrobenzene or nitronaphthalenes, which have the effect of preventing the simultaneous formation of leucogallocyanines. The condensation products thus obtained are green crystalline products appearing bronze by reflected light. They are little soluble in water and alcohol, soluble in acetic acid to a blue solution, and in concentrated sulphuric acid to a red solution. This solution becomes yellow-brown on addition of water. The condensation of the gallocyanins with the diamins may be carried out in the absence or presence of appropriate solvents.

BLUE QUINOLINE DYE AND PROCESS OF MAKING SAME.

Benno Homolka of Frankfort-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister Lucius & Brüning. Patent No. 844,804, dated February 19, 1907.

By the action of alkalies on the salts of certain alkylammonium bases of the quinoline series Spalteholz obtained red dyestuffs (*Berichte d. D. Chem. Ges.*, XVI, 1851) which were further examined by Hoogewerff and Von Dorp and called "isocyanines," (*Recueil des Travaux Chimiques des Pays Bas* III, 346). Miethe and Book have cleared up the constitution of these dyestuffs (*Ber. d. D. Chem. Ges.*, XXXVII, 2008), while finally a series of homologues and substituted isocyanines became known by the United States Patent No. 805,143.

The inventor found that the salts of such alkylammonium bases of the series of quinolines, or the salts of mixtures of such bases which by the action of alkalies yield isocyanines, may yield under other conditions blue dyestuffs—namely, if these salts be treated with alkalies in presence of formaldehyde. If, for instance, alkali be allowed to act on the alcoholic solution of a mixture of quinaldin-etho-iodide and quinoline-etho-iodide, a red dyestuff may be obtained which Hoogewerff and Von Dorp (*loc. cit.*) have called "diethyliso-cyanine;" but if to the alcoholic solution of the same mixture of quinoline-etho-iodide and quinaldin-etho-iodide be first added formaldehyde and finally alkali, or the formaldehyde simultaneously with the alkali, then no longer the red diethyliosocyanine, but a new beautifully blue dyestuff is obtained. These new dyestuffs are called "cyanols," and have ascertained that each "isocyanine" corresponds with a "cyanol." (Compare E. Valenta, *Photogr. Correspondenz*, XLIII *Band*, 3 *Heft*, 1906, p. 132.)

The new dyestuffs are not suitable for coloristic purposes, as they are not fast to light; but they are particularly suitable for the manufacture of panchromatic photographic plates, being the best photographic sensitizers now existing.

MONOAZO DYE AND PROCESS OF MAKING SAME.

Thilo Kroeber of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 844,814, dated February 19, 1907.

According to the present invention the nitroamido-alpha-naphtholsulphonic acid which can be obtained by reducing naphthol yellow S ($OH : NO_2 : NO_2 : SO_3H = 1 : 2 : 4 : 6$ or 7) in neutral or alkaline solution with iron or alkali sulphide is diazotized and combined with azo components to produce monoazo dyestuffs which are valuable both in direct dyeing and for development by subsequent chroming.

The specific claims relate to the dyestuff obtained by com-

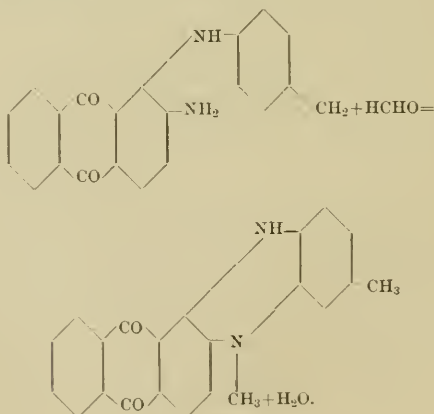
bining nitrodiazo-alpha-naphthol sulphonic acid with betanaphthol.

It dyes unmordanted wool in blue-black shades, which shades become deep brownish black on treatment with chromium compounds.

ANTHRACENE DERIVATIVE.

Karl Thun, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 844,835, dated February 19, 1907.

The inventor claims that amino-aryl-amino-anthraquinones containing the amino group in ortho position with regard to the aryl-amino group are converted into new compounds by treatment with aldehydes. The anthraquinone derivatives produced in this way, which are most probably azines, are crystalline and practically insoluble in water. They can be converted by the action of sulphonating agents—for instance, by means of fuming sulphuric acid—into sulphonic acids, the salts of which are soluble in water and which dye wool from acid-baths from blue to green shades of excellent fastness. The reaction takes place most probably in accordance with the following equation:



Patents for the Year 1907

PROCESS OF MAKING AN ANTHRACENE DYE.

René Bohn, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 844,914, dated February 19, 1907.

In the specifications of U. S. Patents Nos. 739,570 and 753,659 are described methods for the production of halogen derivatives of indanthrene, and it is there stated that these coloring-matters are very fast against the action of chlorine.

It is now discovered that by heating indanthrene with antimony pentachloride in the presence of a suitable solvent—such, for instance, as nitrobenzene—a chlorine derivative of indanthrene can be obtained which possesses all the properties attributed to the coloring-matter described and claimed in the aforesaid specifications of U. S. Patent No. 739,579, but when prepared according to the process of the present invention yields dyeings which are still faster against the action of chlorine.

ORTHO-OXY-MONOAZO DYE.

Willy Schumacher of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 846,511, dated March 12, 1907.

The inventor has found that the ortho-oxy-monazo dyestuff representing the combination of the diazotized nitro-chlor-ortho-aminophenol (NO_2: Cl: NH_2: OH: $=1:2:4:5$), which is a derivative of para-nitraniline and of para-chloro-phenol, with the 1.8-dioxy-3.6-disulphonic acid, is a very valuable dyestuff.

It may be produced, for instance, by allowing the diazotized nitro-chloro-amino-phenol (NO_2: CL: NH_2: OH $= 1:2:4:5$) to act upon 1.8-dioxy-3.6.-naphthalene-disulphonic acid in presence of hydrate of lime. When separated from the acid solution, the dyestuff forms a dark bronze powder soluble in water with a red color.

It dyes wool in an acid-bath red color, which turns a beautiful solid greenish blue when treated with chromates. Such a greenish-blue shade is also obtained by directly dyeing on chrome-mordanted wool.

HALOGENATED RED DYE AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 848,354, dated March 26, 1907.

In the U. S. Patent No. 831,844 is described the manufacture of a red vat-dyeing dyestuff, by heating salicylthioacetic acid

$$C_6H_4\begin{cases}COOH & (1)\\ S.CH_2COOH & (2)\end{cases}$$

with an aromatic nitrohydrocarbon. It is now found that dyestuffs more fast to washing and dyeing yellower red tints and constituting, consequently, more valuable products can be obtained if in this process the salicylthioacetic acid is replaced by its halogenated derivatives containing the halogene in the position "para" relatively to the carboxylic group—as, for instance, metachlor-salicylthioacetic acid—

$$C_6H_3\begin{cases}COOH & (1)\\ SCH_2COOH & (2)\\ Cl & (4)\end{cases}$$

or metabromsalicylthioacetic acid.

$$C_6H_3\begin{cases}COOH & (1)\\ SCH_2COOH & (2)\\ Br & (4)\end{cases}$$

These compounds can be prepared by diazotizing 4-chlor- (or brom) -2-amido-1-benzoic acid, combining the resulting diazo derivative with thioglycollic acid and decomposing finally the so-obtained diazothioether. The transformation of the so-obtained halogenated salicylthioacetic acids into dyestuffs is effected in the manner described for the salicylthioacetic acid.

RED-HALOGEN VAT-DYE AND PROCESS OF MAKING SAME.

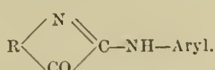
Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 848,356, dated March 16, 1907.

In U. S. Patent No. 841,003 is described the manufacture of a red vat-dyeing dyestuff by condensing salicylthioacetic acid with isatin. It is now found that this dyestuff can be transformed into new exceedingly valuable products by introducing a halogen into its molecule. The thus-resulting halogen derivatives possess relatively to the dyestuff employed as parent material the advantage of a greater affinity to unmordanted cotton, and consequently of a greater fastness to washing. The introduction of halogens into the molecule of the said dyestuff takes place by treating this latter with halogens or with substances able to deliver up halogens, as chlorin, bromin, antimony pentachlorid, sulphuryl chlorid, in the presence of indifferent solvents or dilents as nitrobenzene, glacial acetic acid, &c.

RED-VIOLET TO BLUE VAT-DYES AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. aPtent No. 848,356, dated March 26, 1907.

In U. S. Patent No. 836,309 is described the manufacture of red-violet to violet-blue vat-dyeing dyestuffs by condensing alpha-oxythionaphthene (thioindoxyl) with alpha-isatinarylids of the general formula



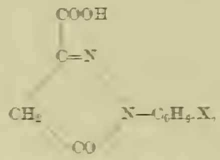
The inventor claims that these dyestuffs can be transformed into new more valuable products by introducing a halogen into its molecule. The thus-resulting halogen derivatives possess rela-

tively to the dyestuff employed as parent materials the advantages of a greater fastness to light and greater brilliancy of shade.

YELLOW WOOL-DYE.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 849,690, dated April 9, 1907.

This invention relates to the production of yellow wool dyestuffs by combining diazotized paratoluidine meta-sulphonic acid ($CH_2.NH_3.SO_3H = 1.4.3$) with pyrazolon derivatives of the general formula:

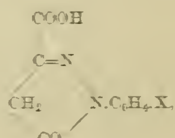


wherein X means a hydrogen atom or a sulpho group. The dyestuffs thus obtained are of excellent fastness to light, surpassing in this point the dyestuffs obtained from isomeric acids.

YELLOW MONOAZO DYE AND PROCESS OF MAKING SAME.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 849,739, dated April 9, 1907.

This invention describes the production of yellow wool dyestuffs by combining the diazotized chlorin derivatives of the orthoaniliin-sulphonic acid with pyrazolon derivatives of the general formula:



wherein X means a hydrogen atom or a sulpho group.

The following table will give some of the properties of the azo coloring-matters obtained according to this invention:

Dyestuff prepared by combination of diazotized—	with—	Dyes wool from acid-bath—
P. Chloranilin-orthosulphonic acid	Sulphophenylpyrazolon-carbonic acid	Lemon yellow.
Chloranilin-orthosulphonic acid	Phenylpyrazolon carbonic acid	Yellow.
Chloranilinsulphonic acid Cl NH_2SO_3H 1 3 4	Sulphophenylpyrazolon-carbonic acid	Yellow.
Chloranilinsulphonic acid Cl NH_2 SO_3H 1 3 4	Phenylpyrazolon carbonic acid	Yellow.
Dichloranilinsulphonic acid Cl Cl NH_2 SO_3H 1 2 4 5	Sulphophenylpyrazolon-carbonic acid	Yellow.
Dichloranilinsulphonic acid Cl Cl NH_2SO_3H 1 2 4 5	Phenylpyrazolon carbonic acid	Reddish yellow.

PROCESS OF MAKING INDIGO.

Arnold Rahtjen and Carl Stephan, of Hamburg, Germany; said Stephan assignor to said Rahtjen. Patent No. 850,444, dated April 16, 1907.

The inventors claim that artificial indigo is obtained when *a*-isatin anilide, dissolved or suspended in a suitable solution, is treated with hydrogen sulphide (H_2S).

This invention consists in a process of making indigo in which this discovery is utilized.

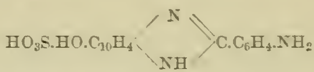
In the practice of the process the *a*-isatin anilide is dissolved or suspended in any suitable alkaline or neutral liquid, ethyl alcohol being well adapted for this purpose. Hydrogen sulphide is then added. Indigo is not in all cases immediately produced upon the addition of the hydrogen sulphide. Sometimes intermediate products result which may be isolated, although that is not necessary for the successful practice of the process. These

intermediate products change into indigo so easily that the application of heat results in the immediate production of indigo. At a lower temperature the intermediate products, dissolved or suspended in suitable liquids which contains an excess of hydrogen sulphide, change into indigo gradually; but the process can be carried out by adding reagents. The anilide split off is easily regained and the separated sulphur is separated from the indigo in the usual manner.

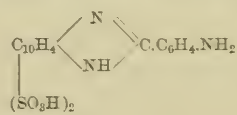
AMIDO-OXY-SULPHONIC ACID OF PHENYLNAPHTHIMIDAZOL AND PROCESS OF MAKING SAME.

Oscar Schulthess, of Berlin, and Leo Kerkovius, of Friedenau, near Berlin, Germany, assignors to Actien Gesellschaft für Anilin Fabrikation. Patent No. 851,444, dated April 23, 1907.

This invention relates to the manufacture of amidooxysulphonic acids of phenyl-1.2-naphthimidazol:



which acids have been found to be a valuable parent-material for the production of dyestuffs. These acids may be prepared by melting an amidodisulphonic acid of the phenyl-1.2-naphthimidazol, as represented by the following formula:



with a caustic alkali.

The claims specify the compound, meta-amidophenyl-1.2-naphthimidazol-5-oxy-7-sulphonic acid which when combined in an alkaline solution with the diazo-compound of aniline, yields a dyestuff dyeing cotton without a mordant a scarlet shade.

Patents for the Year 1907

YELLOW SULPHIN DYE OF THE QUINOPHTHALONE SERIES AND PROCESS OF MAKING SAME.

Albert Bertschmann, of Basel, Switzerland, assignor to tho firm of Society of Chemical Industry in Basle. Patent No. 852,158, dated April 30, 1907.

According to this invention, by introducing even a single sulphhydrate group into quinophthalone derivatives, the latter acquire the character of sulphin dyestuffs which dye cotton without a mordant yellow to orange-yellow tints and may be fixed in the form of their disulphides to produce very fast dyeings.

The sulphhydrate group may be introduced according to the usual methods, either by direct displacement of the amido-group, or through the sulphonic acid derivative or sulphochlorid by reduction.

The simplest procedure for manufacturing the new thioquinophthalone derivatives consists in introducing the thio-group into the phthalic acid residue and condensing the thiophthalic acid with the quinaldines, in the presence or absence of condensing agents and diluents.

ANTHRAQUINONE DERIVATIVE.

Paul Thomaschewski, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent 853,041, dated May 7, 1907.

The inventor has found that acetylized secondary alkylamino- or arylaminoanthraquinones are converted into new compounds by treatment with alkalies. The new anthraquinone derivatives most probably contain a pyridone ring formed by intramolecular condensation. They are more or less colored crystalline compounds of basic character practically insoluble in water and soluble in pyridine and in concentrated sulphuric acid with from a yellow to red color.

The acetylized derivatives of secondary alkylamino- or arylaminoanthraquinones (the parent materials for the production

of the new compounds) can be obtained by boiling the secondary alkylamino- or arylaminoanthraquinones with from twice to five times their weight of acetic anhydrid.

The claims specify the product from 1-methylamino-4-paratolylaminoanthraquinone which when sulphonated dyes unmordanted and chromed wool bluish red shades.

PROCESS OF MAKING ANTRACENE DYE.

Max Isler, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 855,248, dated May 28, 1907.

The inventor has discovered that 1-amidoanthraquinon can be easily converted into azine derivatives of the anthracene series by heating it with a condensing agent, such for instance as hydrochloric acid, sulphuric acid, phosphoric acid, sodium bisulphate, copper sulphate, copper chloride, ferric sulphate, ferric chloride, chromic sulphate, copper chloride, chrome alum, mercuric sulphate, vanadium tetrachloride, aluminium sulphate, aluminium chloride, mercuric chloride, strontium nitrate, barium nitrate, copper phosphate, copper pyrophosphate, and the like. When making use of an acid it is not necessary to use it in the concentrated state since the reaction proceeds with dilute acids, for instance with from twenty, to thirty, per cent. hydrochloric acid, or with from twenty, to forty, per cent. sulphuric acid, and further some of the above mentioned salts may be used in the form of their solutions, for instance instead of using solid aluminium chloride, a thirty-two per cent. solution thereof may be employed. The reaction is preferably carried out in a closed vessel, although, in some cases, an open vessel may be used, and, if desired, an oxidizing agent can be added to the reaction mixture.

The products appear to be identical with the blue coloring matters obtainable as described in the specification of U. S. Patents Nos. 682,523 and 724,789.

Patents for the Year 1907

LEUCO DERIVATIVE FROM GALLOCYANINE.

Wilhelm Lommel, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co., of Elberfeld. Patent No. 856,536, dated June 11, 1907.

In U. S. Patent 629,666 a process for producing leuco-gallocyanins is described, which process consists in treating the gallocyanine dyes with reducing agents.

It is now found that by varying the conditions a new leuco-derivative can be obtained which on oxidation yields a new dyestuff of the oxazine class.

The new leuco-compound is produced by heating gallocyanin (obtained by the action of nitrosodimethylaniline on gallic acid) with alkaline reducing agents for a considerably longer time than is necessary for the formation of the known leuco-compound. It is advantageous to carry out the reaction in the presence of alkaline substances, such as sodium carbonate, caustic soda, or the like, which accelerate the reaction. The higher the temperature the sooner the reaction will be completed and the end of it can be easily determined. As soon as a test portion of the leuco-compound is after being oxidized insoluble in sodium carbonate solution and is soluble in hydrochloric acid of 20° Bé. with a pure blue color the reaction is finished. These tests readily distinguish the new leuco-compound from the known leuco-gallocyanine obtainable from gallocyanine (the product of the action of nitrosodimethylaniline or gallic acid). The latter reforms on oxidation the material from which it is produced namely gallocyanine which, as is known, is soluble in sodium carbonate solution and dissolves in hydrochloric acid of 20° Bé. with a red color. Furthermore the new leuco-compound is distinguished from the above mentioned leuco-gallocyanine by its increased solubility and when used in printing by producing much more easily the chrome-lake of the new dye.

TETRABROMO DERIVATIVE OF INDIGO AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent 856,776, dated June 11, 1907.

Hitherto tetrabromo derivatives of indigo have not been known. The inventor has now found that such tetrabromo substitution products of indigo are produced in an extremely smooth manner and with substantially quantitative yield by treating indigo or its mono- and di-bromo derivatives with suitable proportions of bromin at a raised temperature in presence of appropriate solvents or of appropriate media in which the material may be suspended. The new tetrabromo derivatives of indigo thus obtained are extremely valuable dyestuffs on account of their tinctorial properties, for they can be easily made into vats by the usual methods and dye cotton without a mordant clear blue tints, which are considerably more vivid and of a greener shade than the tints obtained by means of indigo or its known mono- or di-bromo derivatives; moreover, as compared with the latter, they are considerably faster to washing and chlorin.

DYE OF THE ANTHRAQUINONE SERIES AND PROCESS OF MAKING SAME.

Roland Heinrich Scholl, of Karlsruhe, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 856,811, dated June 11, 1907.

In the specifications of U. S. Patent No. 828,778 is described the production of a new class of compounds of the anthraquinone series by heating a halogen anthraquinone with a metal, such as copper, which has the power of withdrawing halogen, and we have termed these new bodies dianthraquinonyl compounds. It is now discovered that 2.2′—dimethyl—1.′—dianthraquinonyl on being heated either alone or with a condensing agent can be

converted into coloring matter which upon reduction with an alkaline reducing agent yields a red vat which yields vegetable fiber red shades, which shades upon washing become from orange to yellow and are then extremely fast. Instead of 2.2′—dimethyl—1.1′—dianthraquinonyl itself, its derivatives such for instance as its dichlor its 4.4′—dimethyl derivatives can be employed and all these compounds are included under the term a 2.2′—dimethyl—1.1′—dianthraquinonyl body. The coloring matters obtained from these derivatives possess the same general characteristics as those of the coloring matter obtained from the parent compound. As condensing agent alcoholic potash is very suitable, but other agents may be employed, such for instance as zinc chloride.

The coloring matter claimed specifically is that obtainable from 2.2′ — dimethyl — 1.1′ — dianthraquinonyl itself. It is a brown powder and yields orange shades on vegetable fiber.

TRIBROMO DERIVATIVES OF INDIGO AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 856,687, dated June 11, 1907.

Hitherto tribromo derivatives of indigo are not known. The inventor has found that such tribromo substitution products of indigo are produced in an extremely smooth manner and with substantially quantitative yield by treating indigo or its mono- and di-bromo derivatives with suitable proportion of bromin at a raised temperature in presence of appropriate solvents or of appropriate media in which the material may be suspended. The new tribromo derivatives of indigo thus obtained are extremely valuable dyestuffs on account of their tinctorial properties, for they can easily be made into vat by the usual methods and dye cotton without a mordant clear blue tints, which are considerably more vivid and of a greener shade than the tints

obtained by means of indigo or its known mono- or di-bromo derivaties; moreover, as compared with the latter, they are considerably faster to washing and chlorine.

MONOAZO DYE FOR LAKES AND PROCESS OF MAKING SAME.

Otto Ernst and Gillis Gullbransson, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 858,065, dated June 25, 1907.

Among the various azo dyestuffs suitable for the preparation of red dye lakes only very few dyestuffs come into consideration as regards obtaining decidedly bluish red shades of great purity in tint and good properties of fastness, especially if sufficient allowance is to be made for other requirements of the lake-dye industry.

It has been found that the monoazo dyestuff from beta-oxy-naphthoic acid-2:3 (melting point 216° C.) with 2-diazo-naphthalene-1-sulphonic acid yields dye-lakes of special value. These lakes possess great tinctorial power having a bluish tint which as regards purity has not been obtained with other dyestuffs. Thus, for instance, the dyestuff from diazotized 2-naphthylamine-1-sulphonic acid + beta-naphthol, not containing the carboxylic group, yields according to U. S. Patent No. 650,757 much redder lakes, which cannot come into consideration respecting the manufacture of blue-red shades. Besides, the dyestuff from oxynaphthoic acid compared to that from beta-naphthol has the advantage of greater fastness to light when applied as chalk lake. From ponceau 4RL yielding similarly dyed lakes, the beta-orynaphthoic acid dyestuff is distinguished by greater tinctorial power. The fastness of the lakes to water is absolute, in spite of the presence of 2 groups forming salts, the sulphonic- and carboxylic group; the fastness to light is also very good. The lakes are particularly valuable for book- and tin-printing, lithography and painting in oil.

BLACK AZO DYE.

Oscar Dressel, of Elberfeld, and Richard Kothe, of Vohwinkel, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 858,444, dated July 2, 1907.

This patent describes the azo dyestuffs, characterized by the glycin radical—$NH—CH_2—COOH$, which dyestuffs can be obtained by combining the tetrazo-compound of the dye-stuff: para-amino-benzene-azo-2-amino-8-naphthol-6-sulphonic acid with two molecules of azo dyestuff components, of which at least one must contain the glycin radical.

Following is the description of the properties of the various dyestuffs so obtained:

Dyestuff obtained from: 1 mol. para-phenylenediamine + 1 mol. 2-amino-8-naphthol-6-sulphonic acid gamma (tetrazotized) +	Dyes cotton:
1. 2 mol. meta-aminophenylglycin..........	Black.
2. 1 mol. meta-phenylenediamine + 1 mol. meta-toluylenediamine	Greenish-black.
3. 1 mol. meta-aminotolylglycin + 1 mol. meta-toluylenediamine	Bluish-black.
4. 1 mol. meta-aminophenylglycin + 1 mol. meta-toluylenediamine	Black.
5. 1 mol. meta-aminophenylglycin + 1 mol. meta-aminophenol	Black.
6. 1 mol. meta-aminophenylglycin + 1 mol. resorcinol	Black.
7. 1 mol. meta-aminophenylglycin + 1 mo 1-naphthylamin-6-sulphonic acid......	Greenish-black.
8. 1 mol. meta-aminophenylglycin + 1 mol. 1-ethylaminonaphthalene-6-sulphonic acid	Greenish-black.
9. 1 mol. glycin of the 1-naphthylamin-6-sulphonic acid + 1 mol. meta-toluylenediamine	Bluish-black.
10. 1 mol. meta-aminophenylglycin + 1 mol. 1-naphthylamin-7-sulphonic acid	Greenish-black.
11. 1 mol. meta-aminophenylglycin + 1 mol. 1-naphthol-4-sulphonic acid	Bluish-black.
12. 1 mol. meta-aminophenylglycin + 1 mol. 2-naphthol-6-sulphonic acid	Bluish-black.
13. 1 mol. meta-aminophenylglycin + 1 mol. 1-amino-5-naphthol-7-sulphonic acid ..	Greenish-black.
14. 1 mol. meta-aminophenylglycin + 1 mol. 2-amino-5-naphthol-7-sulphonic acid ..	Bluish-black.

Dyestuff obtained from: 1 mol. para-phenylenediamine + 1 mol. 2-amino-8-naphthol-6-sulphonic acid gamma (tetrazotized) +	Dyes cotton:
15. 1 mol. meta-aminophenylglycin + 1 mol. 2-ethylamino-5-naphthol-7-sulphonic acid	Bluish-black.
16. 1 mol. meta-toluylenediamine + 1 mol. glycin of the 2-amino-5-naphthol-7-sulphonic acid	Bluish-black.
17. 1 mol. meta-aminotolylglycin + 1 mol. 2-diethylamino-5-naphthol-7-sulphonic acid	Bluish-black.
18. 1 mol. meta-aminophenylglycin + 1 m 2-phenylamino-5-naphthol-7-sulphonic acid	Bluish-black.
19. 1 mol. meta-aminotolylglycin + 1 mol. 2-paratolylamino-5-naphthol-7-sulphonic acid	Bluish-black.
20. 1 mol. meta-aminophenylglycin + 1 mol. 2-amino-8-naphthol-6-sulphonic acid...	Black.
21. 1 mol. acetyl-para-phenylenediamine + 1 mol. 1-naphthylamin-6-sulphonic aci (the acetyl group being split off) + 1 mol. 2-amino-8-naphthol-6-sulphonic acid + 1 mol. meta-amino-phenylglycin	Bluish-black.
22. 1 mol. acetyl-para-phenylenediamine + 1 mol. 1-naphthylamin-6-sulphonic acid (the acetyl group being split off) + 1 mol. 2-amino-8-naphthol-6-sulphonic acid + 1 mol. meta-aminotolylglycin..	Bluish-black.

Their great affinity for the vegetable fiber permits an important simplification in the dyeing of half-woolen goods as it is possible to dye the cotton fiber of such fabrics during the milling process full shades.

BLUISH-BLACK AZO DYE.

Oscar Dressel, of Elberfeld, and Richard Kothe, of Vohwinkel, near Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 859,930, dated July 16, 1907.

This invention relates to the manufacture and production of new bluish-black azo dyestuff containing once or several times the glycin radical

$$—NH—CH_2—COOH.$$

The process for their production consists in combining the tetrazo compound of the dyestuff: para-amino-benzene-azo-2-amino-5-naphthol-7-sulphonic acid either with two molecules of an azo dyestuff component containing the glycin radical (—NH—CH_2—COOH) or with one molecule of such a compound and one molecule of any other azo dyestuff component, or vice versa or in converting into the monodiazo compound the disazo dyestuff

$$\text{para-phenylene}\begin{cases}\text{azo-2-amino-5-naphthol-7-sulfonic acid}\\ \text{azo-X}\end{cases}$$

(X meaning an azo dyestuff component which may or may not contain the glycin radical) and combining the diazo compound thus obtained either with anazo dyestuff component containing the glycine radical or, if X already contains this radical, with any azo dyestuff component. These dyestuffs have been obtained in this way:

Dyestuff obtained from: 1 mol. para-phenylenediamine + 1 mol. 2-amino-5-naphthol-7-sulphonic acid (tetrazotized) +	Dyes cotton:
1. 2 mol. meta-aminophenylglycin..........	Blue-black.
2. 2 mol. meta-aminotolylglycin............	Blue-black.
3. 1 mol. meta-aminophenylglycin + 1 mol. meta-phenylenediamin	Blue-black.
4. 1 mol. meta-toluylenediamine + 1 mol. meta-aminotolylglycin	Blue-black.
5. 1 mol. meta-aminophenylglycin + 1 mol. 1-acetylamino-2.4-diaminobenzene	Blue-black.
6. 1 mol. meta-aminophenylglycin + 1 mol. meta-aminophenol	Blue-black with a violet cast.
7. 1 mol. meta-aminophenylglycin + 1 mol. resorcinol	Greenish blue-black.
8. 1 mol. meta-aminophenylglycin + 1 mol. 1-naphthylamine-6-sulphonic acid	Greenish blue-black.
9. 1 mol. 1-naphthylamin-6-sulphonic acid + 1 mol. meta-aminotolylglycin.........	Blue-black.
10. 1 mol. glycin of the 1-naphthylamine-6-sulphonic acid + 1 mol. meta-phenylenediamin	Greenish blue-black.
11. 1 mol. meta-aminophenylglycin + 1 mol. 1-naphthylamin-7-sulphonic acid.......	Blue-black.
12. 1 mol. meta-toluylenediamine + 1 mol. glycin of the 1-naphthylamin-7-sulphonic acid.........................	Blue-black.

Dyestuff obtained from: 1 mol. para-phenylenediamine + 1 mol. 2-amino-5-naphthol-7-sulphonic acid (tetrazotized) +	Dyes cotton:
13. 1 mol. meta-aminophenylglycin + 1 mol. 1-naphthol-5-sulphonic acid	Greenish blue-black.
14. 1 mol. meta-aminophenylglycin + 1 mol. 2-amino-5-naphthol-7-sulphonic acid...	Blue-black with a violet cast.
15. 1 mol. meta-aminophenylglycin + 1 mol. 2-ethylamino-5-naphthol-7-sulphonic acid	Blue-black with a violet cast.
16. 1 mol. meta-aminophenylglycin + 1 mol. 2-diethylamino-5-naphthol-7-sulphonic acid	Blue-black.
17. 1 mol. meta-phenylenediamine + 1 mol. glycin of the 2-amino-5-naphthol-sulphonic acid........................	Blue-black.
18. 1 mol. meta-aminophenylglycin + 1 mol. 2-paratolylamino-5-naphthol-7-sulphonic acid	Blue-black with a violet cast.
19. 1 mol. meta-aminophenylglycin + 1 mol. 2-paratolylamino-5-naphthol-7-sulphonic acid	Blue-black.
20. 1 mol. meta-aminotolylglycin + 1 mol. 2-amino-8-naphthol-6-sulphonic acid...	Greenish blue-black.
21. 1 mol. meta-phenylenediamine + 1 mol. glycin of the 2-animo-8-naphthol-6-sulphonic acid	Blue-black.
22. 1 mol. meta-aminophenylglycin + 1 mol. 2-phenylamino-8-naphthol-6-sulphonic acid	Blue-black.
23. 1 mol. acetyl-para-phenylenediamine + 1 mol. 1-naphthylamin-6-sulphonic acid (the acetyl group being split off) + 1 mol. 2-amino-5-naphthol-7-sulphonic acid + 1 mol. meta-aminophenylglycin	Blue-black.
24. 1 mol. acetyl-para-phenylenediamine + 1 mol. 1-naphthylamin-6-sulphonic aci (the acetyl group being split off) + 1 mol. 2-amino-5-naphthol-7-sulphonic acid + 1 mol. meta-aminotolylglycin.	Blue-black with a violet cast.

BLUE COTTON DYE AND PROCESS OF MAKING SAME.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 860,220, dated July 16, 1907.

This invention relates to the manufacture of new cotton dyes produced by combining tetrazotized diamidobases with one molecular proportion of a peri-dioxy-naphthalene sulphoacid and one molecular proportion of 2-arylamido-5-naphthol-7-sulphoacid. The thus obtained dyestuffs dye cotton violet to blue shades of excellent brightness surpassing in this point similar commercial azo dyes. The 2-arylamido-5-naphthol-7-sulphoacid, employed in the manufacture of these dyestuffs, makes them fast to sodium carbonate so that they can be dyed in an alkaline or neutral bath.

Among the diamidobases benzidine, tolidine or dianisidine may be used.

BLUE DISAZO-DYE AND PROCESS OF MAKING SAME.

August Leopold Laska, of Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 860,221, dated July 16, 1907.

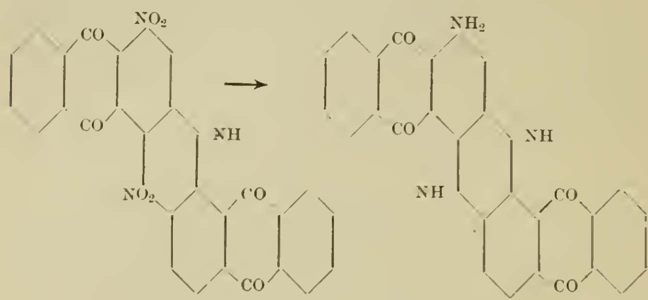
This invention relates to the manufacture of new disazo coloring matter obtained by combining tetrazotized diamido bases with one molecular proportion of a naphthol disulphoacid and one molecular proportion of 2-arylamido-5-naphthol-7-sulphoacid. These dyestuffs dye cotton violet to blue tints of excellent brightness surpassing in this point similar commercial azo dyestuffs. The 2-arylamido-5-naphthol-7-sulphonic acid employed in the manufacture of these dyestuffs renders them fast to sodium carbonate, so that a neutral or alkaline bath can be used in dyeing.

ANTHRACENE DYE AND PROCESS OF MAKING SAME.

Max Isler, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 860,480, dated July 16, 1907.

The inventor has discovered that by melting dinitrodianthra-

quinonylamine with alkali sulphide is obtained a new coloring matter which dyes cotton from an alkaline hydrosulphite vat yielding blue shades. The reaction which occurs probably consists of a reduction of the nitro groups and formation of an azine ring in accordance with the following scheme



The new coloring matter consists of a blue powder which is insoluble in water and in dilute acids and in dilute alkalies.

AZO DYE.

Conrad Schraube and Erhart Schleicher, of Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin & Soda Fabrik. Patent No. 860,575, dated July 16, 1907.

The inventors claim that by combining a diazotized chlorin derivative of orthonitraniline with beta-naphthol, brilliant yellow-orange to orange-red coloring matters can be obtained which coloring matters are characterized by their insolubility in water, their fastness against the action of light, oil, and lime, and their capability of being used to great advantage and in the most varied manner for forming lakes. As one of the chlorin derivatives of orthonitraniline which can be used in carrying out this invention, may be noted 4-chlor-2-nitraniline and 5-chlor-2-nitraniline. The new coloring matters can be produced by com-

bining the aforesaid diazo compounds with a solution of sodium betanaphtholate to which Turkey red oil, oleic acid, soap, or other similar reagent, has preferably been added. In order to prepare pigments, or lakes, from the said coloring matters, either the combination can be made to take place in the presence of one of the substrata usually used in forming pigments, or lakes, such for instance as aluminium hydrate and heavy spar, or the coloring matters can, after their formation, be mixed with a substratum either when in the form of a paste, or by grinding the two compounds together in the dry state.

BLACK MORDANT AZO DYE.

August Leopold Laska, Offenbach-on-the-Main, Germany, assignor to Chemische Fabrik Griesheim-Elektron. Patent No. 863,290, dated August 13, 1907.

This invention relates to the production of new mordant monoazo dyestuffs which may be obtained by combining the diazo compounds of ortho-amidophenol bodies of the general formula

$$C_6H_2.X.Y.\overset{1}{OH}.\overset{2}{NH_2}$$

wherein X and Y means H, CH_3, Cl, NO_2, COOH and wherein that the same derivative contains no more than one NO_2 group, with 2:8-dioxynaphthalene-6-sulpho acid.

It is also found that the formation of the coloring matter best takes place in presence of slaked lime.

The thus obtained dyestuffs dye wool from acid bath bordeaux to black violet shades which, by subsequent treatment with chromates, are converted into violet-black to deep-black ones of excellent fastness to milling and potting process and against light.

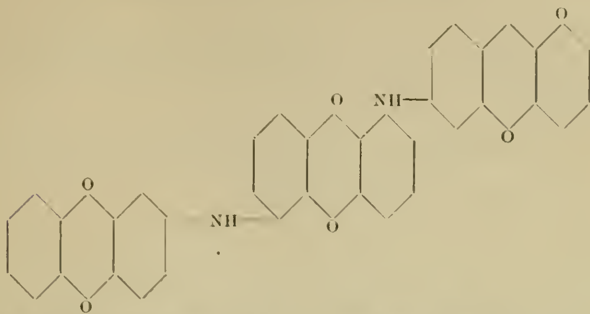
The general properties of some of these dyestuffs are as follows:

Dyestuff prepared by combination of 2:8 dioxynaphtnatene 6 sulfonic acid with diazotized.	Dyes wool.	
	From acid bath.	By subsequent treatment with chromates:
Ortho-amidophenol	Bordeaux	Violet-black.
Para-chlyro-ortho-amidophenol	Bordeaux	Violet-black.
Dichloro-ortho-amidophenol $OH:NH_2:Cl:Cl=1.2.4.6.$	Bordeaux	Blue-black.
Nitroamidophenol. $OH:NH_2:NO_2$. 1 2 4	Bordeaux	Deep-black.
1 2 6	Bordeaux	Greenish-black.
Chloroamidokresol $OH:NH_2:CH_3:Cl$. 1 2 4 6	Bordeaux	Violet-black.
Nitroamidokresol $OH:NH_2:CH_3:NO_2$ 1 2 4 6	Bluish bordeaux	Blue-black.
Nitrochloramidophenol. $OH:NH_2:Cl:NO_2$ 1 2 4 6	Black-violet	Blue-black.
1 2 6 4	Black-violet brown.	Green-black.
Ortho-amido-para-kresotinic acid: $OH:NH_2:CH_3:COOH$ 1 2 4 6	Bluish bordeaux	Violet-black.
Nitroamido para-oxybenzoic acid. $OH:NH_2:COOH:NO_2$ 1 2 4 6	Black-violet	Black.

ANTHRAQUINONE COMPOUND AND PROCESS OF MAKING SAME.

Max Isler and Filip Kacer, of Mannheim, Germany, assignors to Badische Anilin & Soda Fabrik. Patent No. 863,397, dated August 13, 1907.

This invention describes a new class of coloring matters, namely those in which three anthraquinone groups are joined together by means of nitrogen. These compounds are termed dianthraquinonyl-diamido-anthraquinone compounds, and one of the simplest is regarded as possessing a constitution corresponding to the formula



It is found that these new coloring matters can be obtained by reacting with two molecular proportions of 2-chlor-anthraquinone, on one molecular proportion of a diamido-anthraquinone, the particular coloring matter represented by the above formula being obtained when 1.5-diamido-anthraquinone is employed. Other diamido-anthraquinones which can be employed are those obtainable by reducing alpha- and delta-dinitro-anthraquinones.

The new coloring matters can also be obtained by reacting on a beta-beta-dihalogen-anthraquinone with 1-amido-anthraquinone, or with a derivative of the same, such for instance as 1.5-diamido-anthraquinone. Examples of beta-beta-dichlor-anthraquinones which can be used are 2.6-dichlor-anthraquinone and 2-7-dibrom-anthraquinone, and these dihalogen-anthraquinones can be produced from the corresponding diamido-anthraquinones by replacing the amido groups by halogen by means of the Sandmeyer reaction, or from the alpha-alpha-diamido-beta-beta-dihalogen-anthraquinones by eliminating the amido groups in any desirable manner.

The new coloring matters are dianthraquinonyl-diamido-anthraquione products and are in their unsulphonated form insoluble in water and in dilute acids and alkalies and difficulty soluble in most organic solvents.

They are soluble in alkaline hydrosulphite solutions yielding yellowish red to brown-red vats which dye cotton red shades of excellent fastness against the action of alkalies, acids, chlorin, and light.

ANTHRACENE DYE AND PROCESS OF MAKING SAME.

Filip Kacer, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 863,401, dated August 13, 1907.

The inventor has discovered that by treating 1-acetyl-amido-anthraquinone, or a derivative thereof which contains halogen in the anthraquinone residue, with an acid chloride such for instance as phosphorus oxychloride, phosphorus pentachloride, and sulphuryl chloride, and then heating the compounds obtained, either alone or in the presence of a condensing agent and either in the presence or not of a suitable solvent or diluting agent, new coloring matters are obtained. If desired, the acetylation of the amido-anthraquinone body and the treatment with the acid chloride can be caused to take place in one operation.

These coloring matters possess the following general characteristics. They are extremely difficultly soluble in organic solvents, insoluble in caustic soda solution, and soluble in sulphuric acid yielding from red to brown-red solutions. They dissolve in alkaline hydrosulphite solution yielding yellow-brown vats which color cotton dull brown shades. These shades, however, upon washing, become first greenish yellow and then gradually, or more quickly by treatment with dilute sodium hypochlorite solution, become orange to brown. The dyed fiber becomes blue upon treating it with a neutral hydrosulphite solution.

SULPHUR DYE AND PROCESS OF MAKING SAME.

Wilhelm Herzberg, of Berlin, Oswald Scharfenberg, of Schöneberg, and Max Ronus, of Berlin, Germany, assignors to Actien

Gesellschaft für Anilin Fabrikation. Patent No. 864,644, dated August 27, 1907.

This invention relates to the manufacture of new sulphurized dyestuffs by acting with an alkalipoly-sulphide upon an aryl-sulphonic derivative having the general formula:

$$\underset{(4)}{OH}.C_6H_4.\underset{(1)}{NH}.C_6H_3 \begin{cases} R_1 & (3) \\ NH.SO_2.R & (4) \end{cases}$$

in which formula R means an aryl-group, such as for instance H_6H_5 or $CH_3.C_6H_4$, and R_1 signifies another radical, such as for instance chlorine or a hydrogen atom. The reaction may be performed in an aqueous solution, more or less concentrated, as well as with the aid of another solvent, such as for instance alcohol. It is further found, that the new sulphurized products thus formed still contain the residue of the respective aryl-sulphonic acid and that, when this residue is eliminated in a suitable manner, very valuable dyestuffs are obtained which dye cotton directly, from a bath containing an alkali-sulphide, clear and deep blue shades which show a very good fastness to washing and light and are fast to acids; whereas the above-named intermediate compounds dye also cotton without a mordant blue tints, but which tints are not fast to acids.

The reaction, which is the basis of this invention, therefore consists of two parts, the second, namely the elimination of the residue of the respective arylsulphonic acid, may be effected in any suitable manner, for instance by the action of concentrated sulphuric acid.

AZO DYE.

Myrtil Kahn, of Elberfeld, and Richard Kothe, of Vohwinkel, near Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 865,252, dated September 3, 1907.

The inventors have found that a new and valuable azo dyestuff is obtained by combining the diazo compound of 4-chloro-2-amino-phenol-6-sulphonic acid with 1-naphthol-5-sulphonic acid.

The new dyestuff dyes wool from acid baths a bluish-red shade which is changed to a bright fast navy-blue when chromed after dyeing.

AZO DYE.

Myrtil Kahn, of Elberfeld, and Richard Kothe, of Vohwinkel, near Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 865,253, dated September 3, 1907.

Found that a new and valuable azo dyestuff is obtained by combining the diazo compound of 4-chloro-2-aminophenol-6-sulphonic acid with 1-naphthol-4-sulphonic acid.

The new dyestuff dyes wool from acid baths a bluish-red shade which is changed to a fast bluish-violet when chromed after dyeing.

RED-ORANGE MONOAZO DYE AND PROCESS OF MAKING SAME.

Wilhelm Herzberg, of Berlin, and Oscar Spengler, of Nieder-Schöneweide, near Berlin, Germany, assignors to Actien Gesellschaft für Anilin Fabrikation. Patent No. 865,587, dated September 10, 1907.

The present invention relates to the manufacture of a new monoazo dyestuff which may be obtained by diazotizing and combining ortho-chloro-para-nitraniline with beta-naphthol it having been found that the product resulting from this azo-combination is distinguished by its very clear and brilliant red-orange tint and by anex tremely great fastness to light. These advantageous qualities of the new product are present whatever may be the particular manner in which the dyestuff is made. For instance, when producing the dyestuff on cotton cloth, which is done generally speaking in the manner usual for the production of para-nitraniline red, there is obtained a clear brilliant red orange tint the fastness of which to light is much greater than

that of para-nitraniline-red. Besides the dyestuffs may be produced for instance on a substratum of suitable substances such as are used in the production of color-lakes, like aluminum hydroxid or a barium or calcium salt. In this case also the dyestuff or the lake thus produced shows a very clear and brilliant red-orange tint possessing a very great fastness to light; furthermore the lakes thus obtained are insoluble in water and practically insoluble in alcohol and in oil. They are most adapted for chromolithography as well as for paper-staining and for wall-paper printing.

TRIPHENYLMETHANE DYE AND PROCESS OF MAKING SAME.

Wilhelm Herzberg, of Berlin, and Oswald Scharfenberg, of Schöneberg, near Berlin, Germany, assignors to Actien Gesellschaft für Anilin Fabrikation. Patent No. 866,359, dated September 17, 1907.

This invention relates to the manufacture of valuable dyestuffs of the triphenylmethane series, which dye wool in an acid bath clear green shades, by condensing an alkylbenzylaniline sulphonic acid with an arylsulphonic ether of an ortho-oxy-aldehyde of the general formula:

$$R_1.C_6H_3.\underset{(1)}{CHO}.\underset{(2)}{OR},$$

in which R_1 means a hydrogen atom or an alkyl group such as methyl or ethyl or another radical such as for instance chlorin, whereas R means the residue of an arylsulphonic acid such as for instance $SO_2.C_6H_5$ or $SO_2.C_6H_4.CH_3$, and then oxidizing the intermediate leuco-compound. Thus for instance condense the para-toluene sulphonic ether of salicyl aldehyde:

$$C_6H_4\begin{cases} CHO \ (1) \\ O.SO_2.C_6H_4.CH_3 \ (2) \end{cases}$$

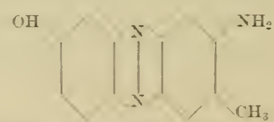
with benzyl ethyl aniline sulphonic acid and by oxidizing the leuco-compound formed is obtained a dyestuff which dyes wool in an acid bath a clear green tint which possesses a good fastness to washing.

For the condensing process any suitable condensing agent, such as, for instance, sulphuric acid may be used; and for oxidizing the new intermediate leuco-compound to the dyestuff, any suitable oxidizing agent may be employed.

REDDISH-BROWN SULPHUR DYE.

Fritz Lehmann, of Vohwinkel, near Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 866,939, dated September 24, 1907.

In the specification for U. S. Patent No. 181,980, dated April 24, 1906, there is described the preparation of a sulphur dye by heating with alkali polysulphide in the presence of substances containing copper the amino-oxytoluphenazine of the following formula:

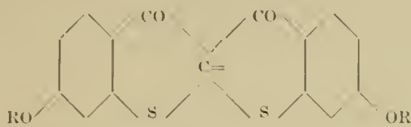


The inventor has now found that aminooxytoluphenazine when heated under certain conditions with alkalipolysulphide without the addition of copper or copper compounds directly yields a valuable clear reddish-brown dye, which of course is free from copper and the dyeings of which on subsequent treatment with copper are not changed into muddy-blue but remain brown. This dye is, therefore, not anticipated by the specification of the said Patent 818,980, inasmuch as the dye described there as obtainable from aminooxytoluphenazine exhibits properties entirely different from those of the dye which forms the object of the present invention.

VAT-DYESTUFF.

Karl Schirmacher and Bernhard Deicke, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 867,305, dated October 1, 1907.

The object of this invention is the production of vat dyestuffs having the general formula:



wherein "R" means ethyl and methyl.

These dyestuffs may be obtained by oxidizing oxythionaphthene derivatives resulting from heating alkyloxyphenylthioglycollic-o-carboxylic acids

$$(RO: SCH_2COOH: = COOH \quad 4: 2: 1)$$

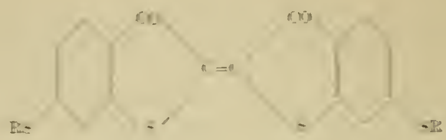
with alkalies.

The new dyestuffs are yellow-red powders insoluble in water. They are little soluble in hot alcohol, glacial acetic acid, benzene and chloroform with a yellow-red and in concentrated sulphuric acid with a red-blue color. When heated with concentrated hydrochloric acid alkyl chlorides are split off. With alkaline hydrosulphite they yield yellow colored vats dyeing wool and cotton beautiful yellow-red tints.

VAT-DYESTUFF.

Karl Schirmacher and Richard Leopold, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 867,306, dated October 1, 1907.

The object of this invention is the production of vat dyestuffs having the general formula:



wherein "R" means ethyl and methyl.

The dyestuffs may be obtained by oxidizing oxythionaphthene derivatives resulting from heating 4-alkylthiophenylthioglycollic-o-carboxylic acids

$$(RS : SCH_2COOH : COOH = 4 : 2 : 1)$$

with alkalies. The new dyestuffs are red powders, insoluble in water. They are little soluble in hot alcohol, glacial acetic acid, benzene and chloroform with a yellow-red color, and are yielding with concentrated sulphuric acid greenish-blue solutions. When heated with hydrochloric acid to higher temperatures they split off alkyl chlorides. With alkaline hydrosulphite they yield yellow colored vats of the leuco compounds producing on cotton and wool beautiful shades similar to alizarine red.

RED-VIOLET VAT DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt and Wilhelm Bertram, of Höchst-on-the-Main, Germany, assignors to Farbwerke vorm. Meister Lucius & Brüning. Patent No. 867,679, dated October 8, 1907.

The inventors have found that on heating dihalogen-thioglycollic-ortho-carboxylic acids with bisulphite solutions at temperatures above 150° C. under pressure, vat dyestuffs are formed which dye cotton and wool in a hydrosulphite vat, for instance, red violet tints.

The claims specify the red violet dyestuff, obtained from 3:5 dichloro-phenylthioglycollic-ortho-carboxylic acid.

PROCESS OF MAKING A HALOGENATED RED DYE.

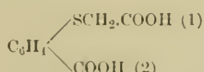
Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 867,714, dated October 8, 1907.

In a previous application for United States Letters Patent is described the manufacture of red halogenated vat-dyeing dyestuffs by treating with a halogen, in presence of an indifferent diluent, the condensation products of equimolecular quantities of alpha-oxythionaphthene (thio-indoxyl) and of an isatin compound. It is now found, that the chloro-derivatives of the said condensation products can also be produced by reacting directly on the said condensation products with a mixture of concentrated hydrochloric acid and of concentrated nitric acid.

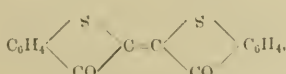
HALOGENATED RED VAT-DYE AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 867,715, dated October 8, 1907.

In the U. S. Patent No. 831,844, dated September 25, 1906, is described the manufacture of a red vat-dyeing dyestuff, by heating salicylthioacetic acid.



in the presence of an aromatic nitro hydrocarbon. It is now found, that this dyestuff, which has the constitution of a thioindigo corresponding to the formula



can be transformed by its treatment with halogens or halogenat-

ing agents into new valuable halogenated derivatives having a greater affinity to cotton and being faster to washing.

The claims specifiy the bromoderivative of thioindigo, which is obtained by treating thioindigo with bromine in presence of nitrobenzene.

VAT-DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister Lucius & Brüning. Patent No. 868,295, dated October 15, 1907.

The inventor has found that aryl-thioglycollic-ortho-carboxylic acid and its homologues and substitution products, when heated with bisulphites to about 150–190° C. under pressure, may be transformed into dyestuffs which on being treated with alkaline reducing agents, like hydrosulphites, become dissolved and dye in this vat cotton and wool.

The claims specify the dyestuff having the formula $C_{16}H_6O_2S_2$-$(CH_3)_2$=1: 3 from tolylthioglycollic-ortho-carboxylic acid (S—CH_2—COOH: CH_3: COOH)=1: 3: 6.

ANTHRACENE DYE AND PROCESS OF MAKING SAME.

René Bohn, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 868,399, dated October 15, 1907.

This invention relates to the production of new coloring matters of the anthracene series. The inventor has discovered that by treating hydroxyanthraquinones, or derivatives thereof, with formaldehyde and with a salt of sulphurous acid in the presence of alkali, new compounds can be obtained which are easily soluble in water and so differ from the hydroxyanthraquinones. The new compounds can be used as coloring matters, or as materials for the production of other compounds.

Following are the properties of some of the new coloring matters obtainable according to the invention:

Coloring matter from—	Water solution.	Shade on chrome mordanted fiber.
Anthracene blue W R	Bluish red	Blue.
Cyclamin	Red	Blue.
Pentacyanin R	Dark Red	Blue.
1. 2. 3. 5. 7-pentaoxy-anthraquinone	Orange	Brown.
Anthrachryson	Yellow-brown.	Red-brown.
Alizarinbordeaux	Brown-red	Violet-blue.

PROCESS OF MAKING INDIGO, &c.

Hans Belart, of Huddersfield, England. Patent 868,755, dated October 22, 1907.

The use of sodium-amid in the manufacture of indigo has been known for some time. The inventor has however discovered that by employing potassium and sodium compounds of aniline, naphthylamine, diphenylamine, tolylamine, xylylamine, as condensing agents results are obtained which practically gives theoretical yields. In this manner indigo can be obtained by heating most of the intermediate products to-day used in the manufacture of synthetical indigo with these condensing agents.

The claim is for the process of making indoxyl and its derivatives, consisting in heating phenylglycin in presence of arylamines with aryl-sodium.

BROWN VAT-DYE.

Albrecht Schmidt, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister Lucius & Brüning. Patent No. 872,085, dated November 26, 1907.

The inventor has found that a new brown vat dyestuff having the formula:

$$NH_2(3)C_6H_3\begin{matrix}(6)CO \\ (1)S\end{matrix}\!\!>C{=}C<\!\!\begin{matrix}CO(6) \\ S(1)\end{matrix}C_6H_3(3)NH_2$$

may be obtained, for instance, by heating meta-amidophenylthioglycollic-ortho-carboxylic acid having the formula:

$$C_6H_3\begin{cases}COOH & (6)\\ SCH_2COOH & (1)\\ NH_2 & (3)\end{cases}$$

or its acidyl derivatives, for instance,

$$C_6H_3\begin{cases}COOH & (6)\\ S.CH_2COOH & (1)\\ NHOC.CH_3 & (3)\end{cases}$$

with alkali hydrates and by oxidizing the leuco bodies, meta-amidoöxythionaphthene carboxylic acid or meta-amidoöxythionaphthene.

The new dyestuff is reduced by alkaline reducing agents, for instance, an alkaline hydrosulphite solution to a leuco compound and dyes from this solution cotton and wool in brown shades.

GREEN-BLACK VAT-DYE.

Albrecht Schmidt, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister Lucius & Brüning. Patent No. 872,086, dated November 26, 1907.

The inventor has found that a new greenish black vat dyestuff having the formula:

$$NH_2(4)CH_3\begin{matrix}\diagup(6)CO\diagdown \\ \diagdown(1)\ \ S\ \diagup\end{matrix}C{=}C\begin{matrix}\diagup CO(6)\diagdown \\ \diagdown S\ (1)\diagup\end{matrix}C_6H_3(4)NH_2$$

yielding with alkaline hydrosulphite solution a yellowish-greenish vat from which wool and cotton are dyed greenish black tints, may be obtained, for instance, by heating para-amidophenylthioglycollic-orthocarboxylic acid of the type

$$C_6H_3\begin{cases}COOH & (6)\\ S{-}CH_2COOH & (1)\\ NH_2 & (4)\end{cases}$$

or its acidyl derivatives, for instance,

$$C_6H_3\begin{cases}COOH & (6)\\ S{-}CH_2COOH & (1)\\ NHOC.CH_3 & (4)\end{cases}$$

with alkalihydrates and by oxidizing the leuco bodies isolated from the melt, para-amidoöxythinaphthene carboxylic acid or para-amidoöxythionaphthene.

MIXED CHLOROBROMO DERIVATIVES OF INDIGO AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 872,115, dated November 26, 1907.

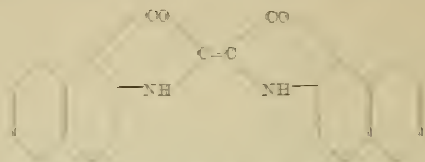
In U. S. Patent Nos. 856,687 and 856,776 are described processes for the manufacture of tri- and tetra-bromo-derivatives of indigo consisting in treating indigo, or mono- or dibromindigo at a raised temperature with bromine in presence of a suitable indifferent diluent or solvent.

It is now found that in an analogous manner mixed chlorobromo derivatives of indigo can be obtained by brominating the known mono- and dichloro derivatives of indigo, whereby according to the chosen starting material and to the quantity of bromin employed monochlorodibromindigo, monochlorotribromindigo, dichloromonobromindigo or dichlorodibromindigo is obtained. Relatively to their chemical and tinctorial behavior these new chlorobromo derivatives of indigo show a great resemblance with the tribromo- and tetrabromo derivatives of indigo described in the said patents. By treatment with alkaline reducing agents, the new mixed chlorobromo derivatives of indigo yield a vat wherein unmordanted cotton is dyed bright violet to blue tints of excellent fastness.

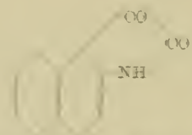
GREEN VAT-DYE AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to firm of Society of Chemical Industry in Basle. Patent No. 872,227, dated November 26, 1907.

It is known that the dyestuff designated beta-naphth-indigo and corresponding with the constitutional formula:



dyes cotton without a mordant in an alkaline vat green tints. On account of the want of fastness of these tints to washing and their poor degree of fastness to chlorine, beta-naphthindigo presents no tinctorial interest. It is now discovered that the tinctorial properties of beta-naphthindigo can be considerably improved by introducing a halogen into the molecule. This change can, for example, be affected by first subjecting beta-naphthisatin



to the action of a halogen or of a substance yielding a halogen, best in presence of an indifferent solvent or diluent and then treating the halogenized derivatives of beta-naphthisatin thus obtained, preferably after transforming them into corresponding chlorids, with suitable reducing agents. There are thus obtained halogen substitution derivatives of beta-naphthindigo which constitute products of very great value, since they dye cotton without a mordant in an alkaline vat vivid green tints of excellent fastness to washing and good fastness to chlorine.

DYESTUFF FROM LOGWOOD AND PROCESS OF MAKING SAME.

Francis J. Oakes, of New York, N. Y. Patent No. 872,250, dated November 26, 1907.

Vegetable coloring matter extracted from logwood and commonly designated as hematoxylin has been, in practice, suffi-

ciently oxidized by bringing atmospheric air into contact with a solution thereof, the resulting product being well known as hematin. The aforesaid process for producing hematin imparts thereto, however, an acid character, which is not, in all cases, desirable, as for instance in the process of therewith dyeing skein silk black in a soap bath, in which case the said acidity of the hematine may unduly decompose the soap, thereby undesirably setting free fatty acids, which results in what is known in the art as "breaking the soap," the injuriousness of which, both to the bath and the article dyed are well understood by those skilled in the art. It is now found that this undesirable acid condition of the hematin for the purposes described and other analogous purposes may be largely, if not entirely, overcome and a practicable neutrality imparted by adding to the hematin, at the conclusion of the said oxidation process, a sufficient quantity of an alkaline nitrite, either in the form of a dry salt, or, preferably in a watery solution, which, combining with the acid, results in the production of the practically neutral hematin.

MONOCHLOROMONOBROMO DERIVATIVES OF INDIGO AND PROCESS OF MAKING SAME.

Gadient Engi, of Basel, Switzerland, assignor to the firm of Society of Chemical Industry in Basle. Patent No. 872,280, dated November 26, 1907.

In U. S. Patent No. 872,115 is described the manufacture of mixed tri- and tetrahalogen derivatives of indigo, consisting in treating mono- or dichloroderivatives of indigo with the required quantity of bromine. The inventor further claims that in an analogous manner mixed dihalogenderivatives of indigo, that is to say, monochloromonobromo derivatives of indigo can be obtained by brominating the known monochloro derivatives of indigo (resulting from the reaction of chlorine on indigo) with 2 atomic proportions of bromine in presence of a suitable indifferent diluent or solvent.

ORANGE VAT-DYE AND PROCESS OF MAKING SAME.

Albrecht Schmidt and Carl Pretzell, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 872,585, dated December 3, 1907.

The claims are for:

1. The process of making orange colored vot dyestuffs which consists in treating with a halogen the brown vat dyestuff obtained by heating meta-acetylamidophenylthioglycollic-ortho-carboxylic acid

$$H_6H_3 \begin{array}{ll} / COOH & (6) \\ - SCH_2COOH & (1) \\ \backslash NHOC.CA_3 & (3) \end{array}$$

with alkalihydrate and by oxidizing the leuco bodies thus obtained.

2. As new product, the halogenated orange colored vat dyestuff, being insoluble in water, alkalies, dilute acids, alcohol, acetone, soluble with difficulty in hot nitrobenzene with an orange-brown color, soluble in concentrated sulphuric acid with a cornflower-blue color, yielding with alkaline hydrosulphite a vat from which cotton and wool are dyed in fast orange colored tints.

SAFRANINE DYE AND PROCESS OF MAKING SAME.

Heinrich Heimann, of Berlin, Germany, assignor to Actien Gesellschaft für Anilin Fabrikation. Patent No. 872,815, dated December 3, 1907.

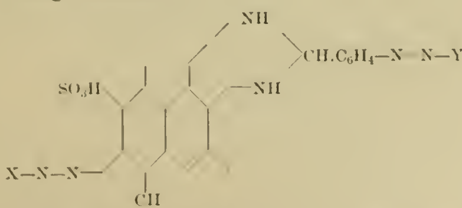
The inventor has found that a new class of nitro-safranines, namely such nitro-safranines which are exclusively composed of benzene nuclei, may be obtained by starting from a para-nitro-para-aminodiphenylamine sulphonic acid, which acids are converted into indamin by joint oxidation with a secondary or tertiary aromatic amine or a sulphonic acid of such an amine these indamines on their part yield the new nitro-safranines by further joint oxidation with an aromatic amine or with a

sulphonic acid of such an amine. As an example of such a nitro-safranin may be cited the dyestuff which is specifically claimed, obtained by joint oxidation (for instance with potassium bichromate and a mineral acid) of para-nitro-para-amino-diphenylamine-ortho-sulphonic acid with ethylbenzylaniline sulphonic acid and converting the indamine thus obtained into the safranine derivative by further joint oxidation with sulphanilic acid. It is found, that these new coloring matters of the safranine series, which dye wool from an acid bath clear blue-red tints, are converted by suitable reducing agents into the corresponding amino-compounds, these new amido-safranines being very valuable dyestuffs, dyeing wool from an acid bath clear blue tints, which, generally speaking, are fast to light and alkalies.

RED AZO DYE AND PROCESS OF MAKING SAME.

Rudolf Schüle, of Frankfort-on-the-Main, Germany. Patent No. 873,798, dated December 17, 1907.

The inventor has discovered that valuable direct colors, dyeing cotton yellow-red to claret-red shades, are obtained if the monoazo dyestuffs resulting from diazo bodies and the product of condensation of m-amidobenzal-dehydebisulphite and 1.2.-diamido-5-oxynaphthalene-7-sulphoacid are diazotized and combined with naphtholsulphonic acids. This process may also be reversed, viz.: by first diazotizing the product of condensation mentioned, then combining with naphtholsulphonic acids, and finally coupling with diazo bodies. The resulting coloring matters are probably of the following constitution:



They are derivatives of a phenyldihydra-naphthimidazol.

THIO-INDOXYL DERIVATIVES AND PROCESS OF MAKING SAME.

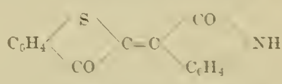
Karl Albrecht, of Biebrich, Germany, assignor to the firm of Kalle and Company, Aktiengesellschaft. Patent No. 874,649, dated December 24, 1907.

The claims cover:

1. The process of manufacturing a red coloring matter consisting in combining thioindoxyl carboxylic acid with isatin.

2. The process of manufacturing a red coloring matter consisting in combining thioindoxyl with isatin.

3. The new dyestuff, having the following constitution



consisting of scarlet red needles, possessing a metallic luster, being insoluble or difficultly soluble in the usual solvents, soluble in concentrated sulphuric acid with a brown color, and which may be transformed by reducing agents into a leuko compound, capable of being reoxidized and precipitated as the dyestuff from its aqueous solution by exposure to air.

ANTHRACENE DYE.

Joseph Deinet, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 874,743, dated December 24, 1907.

This invention relates to the production of a new dyestuff of the anthracene series from which a vat can be prepared and which dyes unmordanted cotton brown shades from such a vat.

The process for its production consists in treating a solution of anthraquinone in sulphuric acid with metals.

In carrying out the process practically proceed as follows, the parts being by weight: A mixture of 10 parts of anthraquinone, 7 parts of powdered copper and 200 parts of sulphuric acid (66° Bé), which mixture has to be continuously stirred, is

slowly heated to 100–120° C. until the evolution of gas ceases. The melt is stirred into water and the precipitate is filtered off and washed.

ANTHRACENE DYE.

Joseph Deinet, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 874,744, dated December 24, 1907.

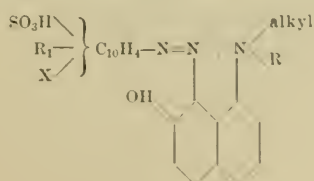
This invention relates to the production of a new dyestuff of the anthracene series from which a vat can be prepared and which dyes unmordanted cotton olive-green shades from such a vat. The process for its production consists in treating a solution of alpha-methylaminonanthraquinone in sulphuric acid with metals, *e.g.*, aluminum copper, silver, or the like.

In carrying out the process practically proceed as follows, the parts being by weight: 20 parts of alpha-methylaminonanthraquinone are dissolved in 400 parts of sulphuric acid (66° Bé.) heated to 25–30 C., and 5 parts of aluminum bronze are then slowly added to the mixture which is heated to 90–100° C. for half an hour. The melt is stirred into 5–6000 parts of water, the precipitate is filtered off and washed until it is neutral.

GREENISH-BLACK AZO DYE.

Walter König, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 874,967, dated December 31, 1907.

This invention relates to the preparation of new azo dyestuffs having the following general formula:



(R stands for hydrogen or an alkyl; R_1 for hydrogen or a substituent; and X stands for hydrogen or the sulphonic acid group), which dyestuffs can be obtained by combining in alkaline solution the diazo compounds of sulphonic acids of 1-naphthylamin compounds with 1-amino-7-naphthol alkylated in the NH_2 group.

In the following table the shades on wool of some of the new dyestuffs are given.

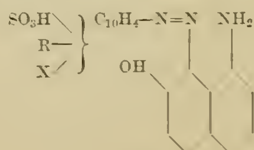
1) 1-naphthylamine-4-sulfonic acid + 1-monomethylamino-7-naphthol	Blue-black.
2) 1-naphthylamine-4-sulfonic acid + 1-dimethylamino-7-naphthol	Greenish-black.
3) 1-naphthylamine-4-sulfonic acid + 1-mono-ethylamino-7-naphthol	Blue-black.
4) 1-naphthylamine-4-sulfonic acid + 1-monobenzylamino-5-naphthol	Greenish-black.
5) 1-naphthylamine-5-sulfonic acid + glycin of 1.7-amino-naphthol	Blue-black.
6) 1-naphthylamine-5-sulfonic acid + 1-benzylamino-7-naphthol	Greenish-black.
7) 1-naphthylamine-6-sulfonic acid + 1-benzylamino-7-naphthol	Greenish-black.
8) 1-naphthylamine-5.7-disulfonic acid + 1-benzylamino-7-naphthol	Greenish-black.
9) 1-amino-2-naphtholethylether-6-sulfonic acid + 1-benzyl-aminc-7-naphthol	Greenish-black.

The specific claim is for compound No. 6.

VIOLET-BLACK AZO DYE.

Walter König, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 874,968, dated December 31, 1907.

This invention relates to the preparation of new azo dyestuffs having the following general formula



(R stands for hydrogen or a substituent; and X stands for hydrogen or the sulphonic acid group), which dyestuffs can be obtained by combining in alkaline solution the diazo-compounds of sulphonic acids of 1-naphthylamin compounds with 1-amino-7-naphthol.

They are very good level acid dyeing colors of strong covering power, producing on wool from brown to deep black shades of good fastness to washing. Cotton checking threads in wool pieces are not dyed by the new colors.

In the following table the shades on wool of some of the new dyestuffs are given.

1) 1-naphthylamine-2-sulphonic acid...........		Deep violet-red.
2) 1-naphthylamine-3-sulphonic acid...........		Reddish-violet-black.
3) 1-naphthylamine-4-sulphonic acid...........		Violet-black.
4) 1-naphthylamine-5-sulphonic acid...........		Violet-black.
5) 1-naphthylamine-6-sulphonic acid...........		Reddish-violet-black.
6) 1-naphthylamine-7-sulphonic acid......	+ 1.7-amino-naphthol.	Bluish-violet-black.
7) 1-amino-2-naphthol-ethylether-sulphonic acid..................		Bluish-violet-black.
8) 1-naphthylamine-2.4-disulphonic acid.......		Reddish-brown.
9) 1-naphthylamine-4.7-disulphonic acid.......		Violet-black.
10) 1-naphthylamine-5.7-disulphonic acid.......		Violet-black.

The specific claim covers compound No. 3

II.—PROCESSES OF APPLICATION.

PROCESS FOR DYEING TEXTILE FIBRE VIOLET-BLUE.

Oscar Bally, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 840,419, dated January 1, 1907.

This invention relates to methods of dyeing and printing with certain coloring-matters.

In the specifications of U. S. Patents Nos. 809,892, 818,992, and 820,379 is described the production of violet-blue coloring-matters by heating with caustic alkali a compound containing a benzanthrone group.

The inventor claims that when both dyeing and printing the coloring-matters have to be reduced in the presence of an alkali. When printing, the dyes can be printed in a mixture with the reducing agent and an alkali on the fiber and then steamed, or they can be printed in admixture with the reducing agent without the addition of an alkali and the printed material subsequently passed through the alkali. Fiber which has been thus incorporated with one of the afore-mentioned violet-blue coloring-matters can be recognized, since it yields the following reactions: Upon boiling with hydrochloric acid it remains practically unaltered in color, upon treatment with caustic-soda solution it becomes redder, and upon treatment with concentrated sulphuric acid it changes to a color ranging between greenish-blue and red-violet, and upon subsequent treatment with water it shows a violet color.

PROCESS OF DYEING TEXTILE FABRICS.

Ernst Spatz, of Hackensack, New Jersey, assignor to United Piece Dye Works. Patent No. 842,122, dated January 22, 1907.

The claim is for:

The improvement in the dyeing of fabrics, which consists in causing the fabric to travel first in one direction and then in the opposite direction through a constantly renewed and overflowing bath of dyeing liquor, collecting the overflow, and then passing the fabric back and forth through the collected overflow.

PROCESS OF REDUCING INDIGO COLORING-MATTERS.

Robert Wimmer, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin & Sóda Fabrik. Patent No. 843,566, dated February 5, 1907.

In the specification of U. S. Patent No. 820,900 is described a process for the reduction of indigo and similar coloring-matters by means of iron in strong caustic-alkali solution.

The inventor now claims that indigo and similar coloring-matters can be reduced by means of iron without it being necessary to have present such large quantities of caustic alkali, nor, indeed, any caustic alkali, and that iron in the presence of certain alkali salts has the power of reducing indigo, and that therefore in the process described in the aforesaid specification the caustic alkali can be partly or wholly replaced by such alkali salt. The salts which can be used according to this invention are the alkali salts of indigo-white, the alkali carbonates, the alkali phosphates, and the alkali sulphides. The carbonates, phosphates, and sulphides of the alkalies should be used in concentrated solution. The process can be carried out; for instance, by adding indigo and the corresponding quantity of iron to a solution of the disodium salt of indigo-white, preferably containing at least twenty (20) per cent. of indigo-white. The indigo undergoes reduction and forms the soluble monosodium salt of indigo-white or it separates out in the form of free indigo-white itself, which can by the addition of caustic soda be converted into the soluble sodium salt.

METHOD FOR PREPARING FIBERS.

Thomas Gunni Saxton, of Lexington, Kentucky, assignor of fifty-one one-hundredths to Charles J. Bronston, of Lexington, Kentucky. Patent No. 845,267, dated February 26, 1907.

This invention relates to a method and apparatus or machine for crushing or dismembering the stalk or woody part of hemp, jute, ramie, manila, or other similar fibers and removing therefrom all matter except the fiber by compressed air or other compessible gas delivered thereto to adapt the fiber for use in textile manufacture.

The preferred apparatus or machine in which the method is practiced embodies crushing or dismembering rolls preferably having spiral ribs or analogous surface projections to which the stalk or woody part of the hemp, jute, ramie, manila, or other similar fiber is fed, and these rolls may be disposed in multiple series in sequence to effectively separate the fiber and subject the latter to the action of compressed air, and thereby produce a superior fiber substance for general manufacturing purposes. To render the crushing or dismembering of the stalk or woody part certain and beneficial, particularly in view of the final cleaning of the fiber by the use of compressed air, it is preferred that the rolls have longitudinal sliding movement one with respect to the other. The compressed air is applied to the fiber at such point as to be most effective in performing a cleaning operation and to remove leaves or other parts detrimental to the use of fiber for textile purposes. In the use of air or gas for this purpose it is necessary that it be highly compressed before delivery or application, so that the expansion of the air or gas when liberated in the outlet means of the machine through which the fiber is passed will result in a more thorough and complete permeation of the fiber by the air or gas to drive out small particles of leaves or other material that may cling to the fiber.

PROCESS FOR UNGUMMING SILK.

Peter Schmid, of Basel, Switzerland. Patent No. 848,605, dated March 26, 1907.

This invention relates to a new process for ungumming natural silk, natural-silk waste, and yarns and tissues of natural silk or of natural-silk waste, with the object of freeing these products from the sericin envelop which surrounds the raw natural-silk fiber.

This new process consists in treating the silk to be ungummed with soap-lather in the presence of steam and air for the purpose of softening and rendering soluble the sericin envelop, so that the latter may afterward be eliminated simply by washing in water.

METHOD OF STIFFENING PILE FABRICS.

Frederic E. Kip, of Montclair, New Jersey. Patent No. 848,908, dated April 2, 1907.

The present process or method of stiffening pile fabrics has for its object to apply more than the usual quantity of the stiffening solution to the back of the fabric without risk of its going through and injuring the pile on the face and to effect a more thorough drying by applying the heat directly to the back of the fabric. By applying the heat directly to the coated surface and without passing through the pile side of the fabric the coated surface is dried quicker and the silkiness of the pile imparted by previous finishing processes is retained.

In carrying out the invention a thick stiffening solution is first applied to the back of the fabric in a thin film, and this film is then dried thereon. A thinner solution of the same material is then applied in greater quantity to the already-coated surface and this second coating is dried. The surface is then smoothed or polished with hot irons. The drying of the coats of stiffening material is effected by radiant heat applied directly to the back of the goods which is coated with the stiffening material.

PROCESS OF FIXING OR SETTING THE COLORS OF DYED FIBERS AND FABRICS.

Louis B. Fortner, of Philadelphia, Pennsylvania. Patent No. 852,943, dated May 7, 1907.

This process consists essentially in subjecting the dyed fibers or fabrics to the action of formaldehyde (CH_2O), the latter being either in a gaseous or saturated form and being used alone or combined with an alkali or alkaline salts; either in a hot or cold state, and the treatment being conducted in such manner, and for such a length of time as particular circumstances may require. It is essential that the fiber or fabric operated upon shall be thoroughly impregnated by the formaldehyde. The inventor claims that the formaldehyde treatment will fasten and develop the color of dyed fibers and fabrics, such chemical effecting the condensation of the coloring matter upon the fibers and fabrics, at the same time rendering inert any loose color; thereby greatly increasing the fastness of the color of the goods and effectually preventing its washing away or bleeding into the white during any subsequent washing operations to which the fibers or fabrics may be subjected.

PROCESS FOR THE PRODUCTION OF TRANSPARENT PATTERNS AND THE LIKE ON TISSUES.

Arthur Giebler, of Chemnitz, Germany. Patent No. 853,966, dated May 21, 1907.

This invention relates to a process for producing patterns, designs, letters and the like on half-silk and silk tissues of all kinds, especially tissues used for umbrellas, window-shades, curtains and draperies. The patterns and so on produced according to my invention have the properties of being invisible or at least hardly visible if the rays of light are reflected thereof, but to appear in penetrating light. These properties are achieved by changing the volume of each single thread, the latter being brought in contact with a chemical substance, which causes these

threads to shrink, to diminish in size. The adjacent meshes of the shrunken threads will naturally become larger, thereby making the meshes within the limits of the design to appear transparent and stand out against the remaining darker ground.

The chemical substances are brought upon the tissues by well known means of printing, such as dies or rollers. Suitable means to cause a changing of volume or properly spoken a shrinking of the single thread are all chemical substances, where acetic acid forms a union with some oxid of the heavy metals, such as are contained in the iron or aluminium groups. These acetates must be thickened by some well known means in order to form a pulpy mass of adequate thickness for printing purposes. The most suitable substance, for instance, would be acetate of chromium in a thickened state.

PROCESS FOR DYEING GRANULATED LEATHER IN DIFFERENT COLORS OR SHADES.

Gustav Feldmann, of Berlin, Germany. Patent No. 854,032, dated May 21, 1907.

The process consists in treating the leather by hand with an impregnating material, rich in fat, in such a way that the raised places on the granulated surface are coated with the same, the indentations or crevices on the other hand remaining absolutely free. The leather so treated may have its original natural tint, or it may have been previously dyed.

The treatment by hand is an important feature of the process, because the granulated surface is in no way injured, and a uniform distribution of the impregnating material on the raised places is produced.

As impregnating material some material rich in fat is used, such as a mixture of equal parts of grease and wax, which either completely prevents the penetration of the color on the raised places, or greatly impedes it.

The impregnating material should be of a solid or semi-solid

consistency so that it does not spread or penetrate into the crevices of the granulation.

After the impregnation the leather is dyed or after-dyed in the ordinary way, in which treatment either the same, or another shade, or another color can be applied. The raised places on the granulated surface, treated with the impregnating material, appear after the dying in lighter or other shades in contrast with the indentations or crevices, according as the leather is dyed after the impregnation with the same, or another shade, or color.

The advantages of this process is that by a suitable choice of colors, the granulation of the leather can be accentuated or modified to produce various special effects.

METHOD OF APPLYING SMALL QUANTITIES OF FLUIDS ON FABRICS.

Carl F. Kübler, of Düsseldorf, Germany. Patent No. 856,886, dated June 11, 1907.

This invention refers to a method of applying small quantities of fluids on fabrics and the object of it is to apply such small quantities of fluids in perfect equal distribution.

None of the heretofore known means such as sprinkling-device, picot-printing, pad- or slide-printing and so on could be used for applying a small quantity on surfaces of fabrics in equal distribution, they all had more or less defects, such as unevennesses, sprinkling-spots, stroke or stripes and the like. In printing or applying small quantities of liquid it is generally the aim to produce shiny or glossy shot-effects, whereby merely the foundation of the fabric is supposed to shine through.

According to this invention the desired equalness in applying small quantities of liquor such as color, dye, or the like to fabrics is obtained by distributing the liquid evenly first on a soft close brush and from this on the fabric.

WATERPROOF-COATED LINEN AND PROCESS FOR PRODUCING THE SAME.

Eduard Adolph Closmann, of Tegel, near Berlin, Germany. Patent No. 861,435, dated July 30, 1907.

This invention relates to the coating of starched and ironed goods to form an impervious layer or waterproof coating whereby collars, cuffs, or any other linen may be washed and cleaned without removing the starch or destroying the gloss or stiffness of the same. Heretofore for this purpose, starched goods have been coated with albumin and with a mixture of a white dye stuff and ordinary varnish. It has been impossible however to obtain satisfactory results in this way for the reason that the coating produced by the varnished mixture or by the varnish mixture and albumin easily cracked and chipped and loosened itself from the linen, besides destroying the natural appearance of the linen.

In carrying out the process, the article to be treated is preferably coated first with a solution of pyroxylin in amyl acetate, which solution contains finely divided zinc-white or some other suitable dyestuff. In this way the meshes of the linen are filled up and a ground is formed for the coating without destroying the natural appearance of the linen. The zinc-white or other dyestuff is held in suspension throughout the solution and serves to close the fine pores in the surface of the linen and to prevent the penetration of the pyroxyline solution into the body of the linen. Thus a coating simply is formed upon the surface of the linen which, as has been found by experiment, retains its natural appearance. Moreover, the linen is not rendered unnaturally stiff by the present process, as the coating does not produce such stiffness as is effected by other processes where the pyroxyline is thoroughly impregnated with the linen. The linen thus grounded is coated one or more times, according to the degree of gloss desired, with a substantially pure solution of pyroxyline in amyl acetate. In this way a coating may be

obtained which is easily cleaned and which neither scales nor cracks or changes its color in use or after repeated cleaning.

PROCESS OF DYEING.

Gustav Adolf Waldinger and Carl Friedrich Iserloth, of Elberfeld, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 873,277, dated December 10, 1907.

In French Letters Patent No. 367,921, filed July 9, 1906, corresponding to U. S. Patent No. 873,636, a process for dyeing vegetable fibers with sulphur coloring matters is described, which process consists in dyeing with these dyestuffs in baths prepared in the usual way with the aid of alkaline sulphids and sulphur coloring matters, but with the addition of ammonium salts. By this process level and uniform shades are obtained which in many cases are even deeper and faster to washing than those obtained without the employment of ammonium salts. This favorable action of the amonium salts seems to be due to the fact that the ammonium salts neutralize the free alkali present in the alkaline sulphid dye-bath and that metal salts capable of binding alkali, such as sodium bicarbonate, bisulphate of sodium, bisulphite of sodium, alum, acetate of aluminium, tartar, etc., will produce the same result. These metal salts are generally added to the baths in such quantities that a distinct smell of H_2S is evolved, but care must be taken that no dyestuff or leuco-compound is precipitated.

PROCESS OF DYEING.

Hans Toepfer, of Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 873,636, dated December 10, 1907.

The inventor has discovered a new process for dyeing the vegetable fiber with sulphur-coloring matters which process avoids in a very simple manner the disadvantage of the frequent occurence of uneven shades.

The new process consists in carrying out the dyeing of the vegetable fiber with sulphur dyes in baths containing the usual alkaline sulphides with the addition of ammonium salts. The favorable action of these compounds seems to be due to the fact that the ammonium salts neutralize the free alkali present in the dye-baths containing sulphides of alkalies. Level and uniform shades are thus produced. It is worthy of note that in many cases the shades are deeper and faster to washing than those obtained without the employment of ammonium salts. An addition of soap, especially soft soap, is often advantageous.

III.—CHEMICAL PROCESSES.

MANUFACTURING CELLULOSE PRODUCTS.

Eduard Eck, of Gross-Anheim, and Ernst Bechtel, of Hanau, Germany, assignors to Hanauer Kunstseidefabrik. Patent No. 839,825, dated January 1, 1907.

This invention relates to a new method of manufacturing cellulose products—such as filaments, films, rods, bars, strips, or plates—which are intended to replace celluloid products, to which they are far superior.

It utilizes the known property of the cellulose to dissolve in a solution of ammonia copper and to furnish on becoming torpid solid products, which are more or less strong or durable. Hitherto this property has been made use of only for the manufacture of filaments, which are more or less fine according to their purpose.

The new method is founded upon the discovery that cellulose products, be it filaments or other objects, will offer a considerably larger resistance to tensile strength and other external influences than hitherto if no endeavors are made to accelerate as much as possible the coagulation of the liquid cellulose; but ample time is allowed for its coagulation and only care is taken to maintain the form of the cellulose after leaving the mouth of the press.

SOLUTION OF CELLULOSE.

Eduard Eck, of Gross Anheim, and Ernst Bechtel, of Hanau, Germany, assignors to Hanauer Kunstseidefabrik. Patent No. 840,611, dated January 8, 1907.

This invention relates to the manufacture of a solution of cellulose with ammoniacal cupric oxid which is fit for the manufacture of cellulose products of every description. Hitherto such

a solution has been manufactured in the manner that cotton or similar cellulose was treated with a previously-prepared solution of ammoniacal cupric oxid. This process, however, required an excessively long time.

The present invention consists of a process of producing the said celluolose solution within a few minutes. This process is characterized in that the solution of ammoniacal cupric oxid is caused to act not in its prepared state, but in its nascent state, upon the cellulose.

The new process is as follows: First, the cellulose is impregnated in an aqueous solution of ammonia, then a paste of cupric oxid is added, and the whole is properly shaken or agitated. The cellulose will readily dissolve, and after a few minutes the solution will be completely ready for use.

The process may also be modified in that the solution of ammonia and the paste of cupric oxid are first mixed, and then before any reaction takes place between them the cellulose is added.

MANUFACTURE OF CHROMIC ACID.

Robert Suchy, of Bitterfeld, Germany, assignor to Chemische Fabrik Griesheim Electron. Patent No. 814,278, dated January 15, 1907.

This invention relates to the extraction of chromic acid from alkali chromates, alkali bichromates, and chromic acid containing sulphuric acid. Chromic acid has already been extracted from the said compounds by converting the bodies combined with the chromic acid into bisulphate; but the difficulty experienced in obtaining chromic acid by this means has been the separation of the chromic acid from the bisulphate, which has been a very troublesome and lengthy operation.

The object of this invention is to effect this separation in a simple manner and in a short time and with the use of very simple apparatus. The mixture of chromic acid and bisulphate is in accordance with this invention heated to the melting-point,

this resulting in the formation of two fluids that are not miscible with each other and can therefore be easily separated from each other by mechanical means.

PROCESS OF MAKING PHENYLGLYCIN.

Robert Schmidlin, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 841,456, dated January 15, 1907.

It is claimed in this invention that phenylglycine may be obtained directly from nitrobenzene by treating it with chloracetic acid and iron.

$$2C_6H_5NO_2 + 2CH_2ClCOOH + 6Fe + H_2O = 2C_6H_5NH_2 + (CH_2ClCOO)_2FE + 5FeO.$$

$$2C_6H_5NH_2 + (CH_2ClCOO)_2Fe + FeO = (C_6H_5NHCH_2COO)_2Fe + FeCl_2 + H_2O.$$

That such a process would give rise to a satisfactory yield of phenylglycine could not be anticipated in view of the absence of smoothness in the simple reaction between aniline and chloracetic acid and of the activity with which the reduction of nitrobenzene by iron proceeds, this last fact rendering it probable that the chloracetic acid would be reduced to acetic acid.

It is possible that the unexpectedly good result may be due to the insolubility of the compound of iron with phenylglycine, which might portect the product from further reaction.

The invention consists in heating nitrobenzene or a homologue thereof with iron and chloracetic acid.

PROCESS OF MAKING FORMALDEHYDE SULPHOXYLATES.

Rudolf Müller and Woldemar Wollenberg, of Höchst-on-the-Main, Germany, assignors to Farbwerke, vorm. Meister, Lucius & Brüning. Patent No. 841,999, dated January 22, 1907.

As by the action of formaldehyde on hydrosulphite ketone sulphoxylates may also be obtained by the action of acetone or ethylmethylketone on alkaline hydrosulphites, which may be isolated afterward by crystallization. These ketone sulphoxylates can also be produced by reducing the products of reaction of bisulphites, sulphurous acid, or hydrosulphite on acetone or ethylmethylketone or by subjecting these compounds to reduction in presence of said ketones.

It is now found that ketone sulphoxylates may be transformed into the more stable formaldehyde sulphoxylates if the former are treated with formaldehyde. By the action of the formaldehyde on ketone sulphoxylates the ketone is eliminated with formation of formaldehyde sulphoxylate, which is readily observed in that the solution of the ketone sulphoxylates treated with the equivalent proportion of formaldehyde no longer reduces indigo sulphonic acid in the cold. The reaction of this process may be interpreted by the following equation:

$$(CH_3COCH_3)NaHSO_2+CH_2O= (CH_2O)NaHSO_2+CH_3CO{-}CH_3.$$

PROCESS OF MANUFACTURING SODIUM PERBORATE.

Otto Liebknecht, of Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Company. Patent No. 842,470, dated January 29, 1907.

This invention relates to a new process for the manufacture of sodium perborate which has proved easy in operation and of a high degree of efficiency.

The inventor has discovered that if an alkali peroxide, such as sodium peroxide, in solution or in suspension in water is treated with boracic acid or an alkali borate, such as borax and carbonic acid, or an alkali bicarbonate, such as sodium bicarbonate, sodium perborate is formed and precipitated in an alkaline solution. This reaction is not the one to be expected,

as sodium perborate and sodium carbonate might have formed sodium percarbonate and sodium metaborate, whereas according to this process besides the sodium perborate a pure concentrated solution of sodium carbonate is obtained, which can be used for other purposes.

PROCESS OF MAKING ALKALI PERBORATES.

Otto Liebknecht, of Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Company. Patent No. 842,471, dated January 29, 1907.

This invention relates to a new process of making alkali perborates which has proved easy and efficient in operation. The inventor has discovered that if an alkali peroxide, such as sodium peroxide, in solution or in suspension in water is treated with boracic acid and carbonic acid a perborate is formed and precipitated in an alkaline solution. In this process besides the perborate a pure concentrated solution of carbonate is obtained which can be used for other purposes.

PROCESS OF MAKING ALKALI PERBORATES.

Otto Liebknecht, of Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Company. Patent No. 842,472, dated January 29, 1907.

The inventor describes a new process of making alkali perborates which has proved easy in operation and of a high degree of efficiency. He has discovered that if an alkali peroxide, such as sodium peroxide, in solution or in suspension in water, is treated with boracic acid or an alkali borate, such as borax and carbonic acid or any other substance containing the carbonic acid, such as an alkali bicarbonate—for instance, sodium bicarbonate—sodium perborate is formed and precipitated in an alkaline solution. Besides the sodium perborate a pure concentrated solution of sodium carbonate is obtained, which can be used for other purposes.

PROCESS OF MAKING ALKALI PERBORATES.

Otto Liebknecht, of Frankfort-on-the-Main, Germany, assignor to the Roessler & Hasslacher Chemical Company. Patent No. 842,473, dated January 29, 1907.

This invention describes a new process of making alkali perborates, which process has proved easy in operation and of a high degree of efficiency. The inventor claims that if an alkali peroxide, such as sodium peroxide, in solution or in suspension in water is treated with an alkali borate, such as borax, and an alkali bicarbonate, such as sodium bicarbonate, perborate is formed and precipitated in an alkaline solution. As a result of this process, besides the perborate a pure concentrated solution of carbonate is obtained, which can be used for other purposes.

PROCESS OF EFFECTING A COMBINATION BETWEEN SELECTED MEMBERS OF THE ALCOHOLS AND FATTY ACID.

Ernst Twitchell, of Wyoming, Ohio. Patent No. 844,426, dated February 19, 1907.

This invention relates to a process for manufacturing certain organic products, such as neutral oils or fats and other compounds, of which there may be a wide range, depending specifically upon the characteristics of the particular compounds selected for the reaction.

The object of the invention is, broadly speaking, to effect a combination between those non-readily-volatile compounds containing alcoholic hydroxyl, of which glycerine and castor-oil may be cited as examples, and a fatty acid, of which stearic and oleic acid may be cited as familiar examples.

The inventor claims that a combination may be easily and completely effected between selected members of the compounds above named by subjecting them under relatively low temperatures to the influence of a sulpho fatty acid or a combination thereof. In other words, the alcoholic compounds above named

will chemically combine with the fatty acids when brought together and heated with a relatively small quantity of one of the sulpho fatty acids, the reagent having a catalytic function, and hence undergoing no decomposition in the reaction induced by its presence. The quantity of the reagent used by its physical characteristics are such that it need not be recovered from the resultant products, and its presence in them is not appreciable. The particular member of this sulpho fatty acid group which gives the best result is a sulpho fatty aromatic acid described in U. S. Patent No. 628,503. It is possible to use a simple sulpho fatty acid; but this reagent is open to the objections pointed out in the prior patent—that is, it is difficult to obtain in a pure state, and it is of such unstable character as to be undesirable where the preferred reagent is obtainable.

PROCESS OF PREPARING ANTHRAQUINONE COMPOUNDS.

Roland Heinrich Scholl, of Karlsruhe, and Max Albert Kunz, of Mannheim, Germany, assignors to Badische Anilin & Soda Fabrik. Patent No. 845,129, dated February 26, 1907.

In another application for Letters Patent is described the production of "dianthraquinonyl" compounds, and they are prepared by heating a halogen anthraquinone with a metal—such, for instance, as copper—which has the power of withdrawing the halogen.

The inventors have now discovered a new process whereby these same dianthraquinonyl compounds can be obtained. In carrying out the invention, treat a diazo anthraquinone compound with a metal, so that the diazo groups are split off and the residues combine together. For instance, in order to obtain the 2.2′-dimethyl-1.1′-dianthraquinonyl which is claimed specifically in the aforementioned specification, 1-amido-2-methyl-anthraquinone is converted into its diazo sulphate and then treat this with copper in the presence of acetic anhydrid whereupon the

diazo group is split off and the required dianthraquinonyl compound is formed.

PURIFICATION OF SULPHURIC ACID.

Vero Charles Driffield and Frederick William Wright, of Liverpool, England, assignors to the United Alkali Company Limited. Patent No. 846,288, dated March 5, 1907.

The object of this invention is to effect in a ready, economical, and satisfactory manner the purification of sulphuric acid from arsenic. This is effected according to this invention by the addition of hydrochloric acid or a suitable chlorid, such as sodium chloride, to the sulphuric acid to be purified and blowing air through. The sulphuric acid may be hot or cold during treatment, since the process may be successfully carried out under a range of temperature varying from 15° C. to 200° C., the best results being obtained between 90° C. and 150° C. The amount of hydrochloric acid added is in accordance with the amount of arsenic present and the degree of purity desired. The hydrochloric acid may be either in liquid or it may be in gaseous form, and it may be added in successive amounts. The air may be blown through either during the addition of the hydrochloric acid or afterward.

PRODUCTION OF ORGANIC SULPHONIC ACIDS.

Michael Jljinsky, of Crefeld, Germany, assignor to R. Wedekind & Co. Patent No. 847,078, dated March 12, 1907.

It has been proposed to sulphonate anthrachinone in the presence of mercury or mercury compounds, thereby obtaining the ortho (1) anthrachinone-mono-sulphonic acid or the ortho (1.5 and 1.8) disulphonic acids. The inventor has now found also that other new sulphonic acids of the anthrachinone may be obtained if the sodium salt of the 2.6 disulphonic acid or of the 2.7 disulphonic acid or a mixture of the two salts, as such a mixture is obtained in usual sulphonating, are further treated with fuming sulphuric acid in the presence of mercury or mercury compounds.

PROCESS OF TREATING STARCH.

Frederick Drittler, of Rutherford, New Jersey, assignor to the Arabol Manufacturing Company. Patent No. 847,658, dated March 19, 1907.

This invention relates to a process for rendering starch capable of swelling in cold water, and consists, essentially, in mixing dry powdered commercial starch with a suitable quantity of a liquid hydrocarbon or hydrocarbons preferably paraffin oil of specific gravity .865 and then adding a suitable quantity of caustic alkali.

PROCESS OF TREATING STARCH.

Frederick Drittler, of Rutherford, New Jersey, assignor to the Arabol Manufacturing Company. Patent No. 847,985, dated March 19, 1907.

This invention consists in mixing dry powdered commercial starch with a suitable quantity of a liquid-halogen substitution product or other derivative of a hydrocarbon and then adding thereto a suitable quantity of caustic alkali. These derivatives are chemically inactive with respect to starch and at ordinary temperatures are liquids of an oily nature and practically insoluble in and non-miscible with water.

Among the various derivatives such liquids as carbon tetrachlorid, carbon bisulphid, nitrobenzene, &c., are satisfactory, particularly carbon tetrachlorid, because of its non-inflammability and comparative inexpensiveness, or a mixture of this compound with crude paraffin-oil of the specific gravity 0.865 in the proportion of one to one by volume.

PROCESS FOR THE PREPARATION OF WATER-SOLUBLE HYDROCARBON DERIVATIVES.

Friedrich Boleg, of Cannstatt, Germany, assignor to Gesellschaft zur Verwertung der Boleg'schen Wasserlöslichen Min-

eralöle und Kohlenwasserstoffe. Patent No. 850,898, dated April 23, 1907.

The subject of the present invention consists of a process for the preparation of water-soluble or easily and permanently emulsifiable hydrocarbon derivatives, especially of aromatic hydrocarbons—such, for instance, as nitrobenzol, phenol, cresol, &c.

For the preparation of these hydrocarbon derivatives there are preferably used as the basis miscible or water-soluble mineral oils.

To render the mineral oils soluble in water, they are treated with crude rosin-oil and are then subjected to a washing and treatment with direct steam and caustic-soda solution in excess, whereupon the resulting alkaline mixture with oil after the separation of the rosin soap-lye is subjected to an oxidation process by the introduction of air under pressure or of ozone, and finally undergoes a shorter or longer treatment under a pressure of from one to one and a half atmospheres at temperatures which correspond to this steam-pressure.

APPARATUS FOR PRODUCING ALKALI HYDRATES AND ZINC SULPHIDE.

Charles Ranson, of Brussels, Belgium, assignor to Henry William de Stuckle, of Dieuze, Germany. Patent No. 850,965, dated April 23, 1907.

The present invention relates to an apparatus for the manufacture of alkali or alkali hydrates, such as potassium or sodium hydrate and of zinc sulphide, according to the process described in U. S. Patent No. 818,192.

EXTRACTION OF AMMONIA FROM GASES.

Walther Feld, of Hönningen-on-the-Rhine, Germany. Patent No. 851,349, dated April 23, 1908.

According to this invention, the ammonia is extracted from the gases by treating the gases with a liquor containing a calcium

salt, which may be held entirely in solution, or partly in solution and partly in suspension, such, for instance, as chloride of lime, sulphate of lime, etc. The impure sulphate of lime, as it occurs in nature and known in the trade as gypsum may be used and also the sulphate of lime obtained in many industries as a by-product. If this treatment were effected at a temperature above 70° C. the reaction would be slow and incomplete, and if it were effected after the gases have cooled, the resulting solution of ammonia salt would be so diluted that distillation and absorption in acids would be necessary to obtain concentrated ammonia products. Therefore the gases receive preliminary treatment whereby the tar and the water are first removed in such a way that practically no ammonia is condensed with either the tar or the water, and then the extraction of the ammonia from the gases is effected by treating the said gases with a liquor containing a calcium salt. By the simultaneous reaction of the ammonia and the carbon dioxide in the gases upon the calcium salt, the corresponding soluble ammonia salt and insoluble carbonate of lime are formed. To complete the reaction, the gases must contain, for each two molecular proportions of ammonia, at least one molecular proportion of carbon dioxide. Should the gases contain an insufficient proportion of carbon dioxide, the proportion may be increased by passing air into the retorts in which the coal, or other gas-yielding material, is distilled, or water gas, or gases of combustion, or other gases containing carbon dioxide, may be added to the gases to be treated; and also the gases containing carbon dioxide may be subjected to the action of the liquor containing the calcium salt.

PROCESS OF MAKING LEAD OXIDE.

Clarence A. Hall, of Philadelphia, Pennsylvania. Patent No. 852,325, dated April 30, 1907.

The principal object of the present invention is to provide an efficient and reliable process for making or preparing lead

oxide which may be of lighter specific gravity than that prepared by heat and which may be of a different structure which can be defined as amorphous as distinguished from the crystalline structure of ordinary lead oxide or litharge.

Comminuted lead is used in the process and it can be obtained in the form of blown lead which is prepared according to well understood methods. The comminuted lead is wet with water and repeatedly showered through a changing body of air under pressure. This causes the surface of the particles to oxidize. The showers of lead particles which have their surfaces to a great or less extent oxidized, plunge into a body of water and the effect of this is to detach the oxide and expose fresh surfaces of the particles which are in their turn oxidized during the repetition of the described steps. The showering of the water wet particles and their plunging into the body of water may be repeated until the required degree of oxidation is attained. The lead oxide is recovered from the water. Instead of starting with particles of metallic lead, the same may have been oxidized to a greater or less extent.

METHOD OF CONCENTRATING NITRIC ACID.

Emil Collett, of Christiana, Norway. Patent No. 854,928, dated May 28, 1907.

In this process the concentration is effected by an air—or gas—current, which by aid of suitable apparatus is brought into an intimate contact with the acid, so that the water contained therein is evaporated. For this purpose the acid is preferably led into a non-corrosive vessel, which is thus arranged, that the hot air—or gas—current passes the surface of the acid and partly is forced into it. By this the water contained in the acid is evaporated. Some of the acid itself, is, however, also volatilized, and in order to regain this acid there is, above the non-corrosive vessel, placed a column apparatus of non-corrosive material, which is fed from above with the diluted nitric acid.

Here the hot vapors and air from the vessel containing the acid are forced through the diluted and cold acid, which is flowing in, whereby the acid vapors are condensed and the diluted acid exposed to a previous heating and partly also to a concentration. After their passage through the column apparatus the vapors continue their way through a cooling tube or worm, and some diluted acid is collected as a distillate. Then the air current passes through a vessel filled with bits of non-corrosive material, where most of the acid contained in the vapors is retained. If at last the air current is led through a vessel filled with limestone and lime, any loss of acid may be avoided, the nitric acid combining with the lime to calcium nitrate, which may be utilized. In this way the chief quantity of nitric acid will be concentrated up to about 60 per cent., while the distillate containing about 10 per cent. of the original quantity of nitric acid may be profitably utilized.

PROCESS OF REGENERATING WASTE LIQUORS FROM THE MANUFACTURE OF CHROME PIGMENTS.

Alexander S. Ramage, of Detroit, Michigan. Patent No. 855,-019, dated May 28, 1907.

The object of this invention is to provide a process by which waste liquors from the manufacture of chrome pigments may be regenerated. The process consists in adding acetic acid to said liquors, dissolving a lead compound therein and precipitating a chrome pigment. This operation is repeated to concentrate the alkali acetate, and the resulting liquor further concentrated by evaporation. The acetic acid is liberated by addition of sulphuric acid, a portion of the sodium sulphate is separated by refrigeration, and the remaining sulphuric acid by precipitation. The resulting acid solution is utilized for the preparation of lead acetate. A chromate of lead is then precipitated from this last solution, and the liquor used for continuing the process.

PROCESS OF BLEACHING OILS AND FATS.

Herman A. Metz, of Brooklyn, New York, and Philip S. Clarkson, of Beverly, New Jersey. Patent No. 856,357, dated June 11, 1907.

This invention is a process of bleaching oils and fats, and consists essentially in subjecting them to the action of certain salts or compounds known as formaldehyde hydrosulphites, by which term it is intended to include the compounds known as formaldehyde hydrosulphites and sulphoxylates.

In the bleaching of various oils it has been usual to subject non-drying and semi-drying oils to the action of oxidizing agents, while in the case of drying oils reducing agents have been used. It is now discovered that the compounds known as formaldehyde hydrosulphites exert a powerful bleaching action on oils and other fats, including those of all of the above-mentioned classes. In the case of the non-drying oils the coloring matter is so effectively destroyed that when the oil is subsequently sulphonated the decrease in color is as marked as in the original oil, indicating the actual destruction of the coloring matter; if the coloring matter were merely reduced the color would be restored by the operations connected with sulphonation.

GALLOCYANINE DYE.

Wilhelm Lommel, of Elberfeld, Germany, assignor to Farbenfabriken Vorm. Friedr. Bayer & Co. Patent No. 856,537, dated June 11, 1907.

The inventor claims that a new coloring matter of the oxazine series is produced from gallocyanine (obtained by the action of nitrosidimethylaniline on gallic acid) by heating the gallocyanine base or its alkaline salts, either in suspension or in solution, until a test portion is soluble in hydrochloric acid of 20° Bé with a pure blue color and is insoluble in sodium carbonate solution. These tests readily distinguish the new dye from gallocyanine which is soluble in sodium carbonate solution and dissolves in hydrochloric acid of 20° Bé with a red color.

The hydrochloride of the new dyestuff forms after drying a dark green powder soluble in water with a reddish-violet color. The new dye is distinguished from gallocyanine from which it is produced, by the greater solubility of its hydrochloride and by giving in printing redder and purer shades.

PROCESS OF PRODUCING CONCENTRATED FORMIC ACID FROM FORMATES.

Emil Franke, of Grünau, near Berlin, Germany, assignor to Chemische Fabrik Grünau Landshoff & Meyer Aktiengesellschaft. Patent No. 857,046, dated June 18, 1907.

In the decomposition of formates by strong acids, the formic acid itself is partially decomposed. The inventor now claims that by the use of an acid salt of a polybasic acid which is stronger than formic acid this may be avoided. For example, sodium bi-sulphate, may be allowed to act directly on formate of soda without previous mixture of the same with formic acid, without fearing decomposition of the formic acid. Comparative experiments as to the decomposition of dry formate of soda with concentrated sulphuric acid, of a mixture of formic acid and formate of soda with concentrated sulphuric acid, and of dry formate of soda with bisulphate of soda gave the following results in the same order, *i.e.*, 60.9, 128.5 and 132.6 grams of formic acid 100 per cent.) were obtained from 200 grams of formate (100 per cent.), *i.e.*, 45 per cent., 95 per cent., and 98 per cent., yield were obtained. From this it is clearly seen that by using sodium bisulphate a previous mixing of the formate with formic acid may be omitted, without fearing a diminished yield.

MANUFACTURE OF SOAP.

Peter Krebitz, of Munich, Germany. Patent No. 858,295, dated June 25, 1907.

This invention relates to processes of making soap and consists in a method of making soap by an organized succession of steps.

each separately useful, and as a whole coöperating to manufacture soap in a cheap and efficient manner.

In the present method an insoluble soap is first prepared in a manner permitting both the production of an article of great purity and desirable characteristics and the production of a glycerine solution, or "sweet water," of good strength and purity. The insoluble soap is then converted into the ordinary potash or soda soluble soap in a cheap, efficient and thorough manner.

The base of the insoluble soap may be lime, strontia, baryta or zinc oxide.

PROCESS OF MANUFACTURING NITRIC ACID.

Wilhelm Ostwald, of Leipzig, Germany. Patent No. 858,904, dated July 2, 1907.

This invention relates to a process of manufacturing nitric acid from a mixture of ammonia and oxygen, or gases containing oxygen, such as atmospheric air, by means of catalytic agents.

The action of catalytic agents, or so-called contact bodies on a mixture of ammonia and oxygen, whereby nitric acid or nitrogen oxides capable of being converted into nitric acid by the further action of oxygen are produced, is known as a laboratory reaction. But it was hitherto impossible to carry out this process on a practical or technical scale for the reason that the yield in nitrogen oxides from a given quantity of ammonia was too small. Now the inventor has found that by maintaining during the reaction certain definite conditions it is possible to convert ammonia into nitric acid or nitrogen oxides, with nearly the theoretical yield.

PRODUCTION OF STABLE, DRY HYDROSULPHITES.

Max Bazlen, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 861,014, dated July 23, 1907.

In the specification of U. S. Patent No. 795,755, a process is described for the production of stable hydrosulphites by heating the precipitated hydrosulphite salts (which contain water of crystallization and also free water) with liquids, or with vapors of liquids, which possess the power of taking up water. The inventor has now discovered that hydrosulphites free from water of crystallization can be separated from their solutions in water by means of the above mentioned liquids, provided that the separation take place at a temperature such that the hydrosulphite in question loses its water of crystallization, this temperature varying with different hydrosulphites; for instance, when sodium hydrosulphite is precipitated by means of ethyl alcohol, the temperature at which the precipitation takes place should not be below 55° C.

PROCESS OF MANUFACTURING LACTATES.

Alan A. Claflin, of Concord, Massachusetts, assignor to Lactic Process Co. Patent No. 861,163, dated July 23, 1907.

The claims cover,

1. In the process of obtaining neutral lactate by the lactic fermentation of a wort suitable therefor and the concomitant neutralization of the lactic acid with alkaline reagents, the method of augmenting the proportion of lactic acid contained in the product, which consists in introducing into the fermenting solution additional fermentable material, as the quantity originally present therein becomes diminished by fermentation.

2. In the process of obtaining neutral lactate by the lactic fermentation of a wort suitable therefor and the concomitant neutralization of the lactic acid with alkaline reagents, the method of augmenting the proportion of lactic acid contained in the product which consists in introducing into the fermenting solution additional fermentable material in such quantity as to maintain at the time of introduction a proportion of fermentable material not substantially greater than that present at the out-

set, and so proceeding until the total amount to be finally subjected to fermentation is sufficient to produce the desired percentage of lactic acid.

3. In the process of obtaining neutral lactate by the lactic fermentation of a wort suitable therefor and the concomitant neutralization of the lactic acid with alkaline reagents, the method of augmenting the proportion of lactic acid with alkaline reagents, the method of augmenting the proportion of lactic acid contained in the product which consists in starting with a solution containing at the outset about ten per cent. of fermentable material; thereafter introducing into the solution from time to time additional fermentable material to supply the place of that which has already undergone fermentation until the quantity so added shall have amounted in the aggregate to substantially as much more as that originally present; and then completing the fermentation of what remains, while maintaining the temperature of the solution within the limits of from about 125° to about 135° F.

PROCESS OF MANUFACTURING LEAD ACETATE.

Adolf Wultze, of Charlottenburg, Germany. Patent No. 861,-345, dated July 30, 1907.

In the processes hitherto known lead acetate was obtained either by dissolving litharge in acetic acid and crystallizing the solution, or the lead reduced to pieces was piled up, moistened by vinegar and then left to the action of air. The acetic lye obtained in this latter manner was then also crystallized.

A method of manufacturing lead acetate is known, according to which acetic acid vapors are brought into contact with metallic lead and in order to insure that the metallic lead offers always a bright surface to the acetic acid vapors acting upon the lead for the purpose of forming lead acetate, lead liquor is sprinkled over the metallic lead for washing down the lead acetate.

The subject of this invention now is a process for obtaining lead acetate also from metallic lead but by a continuous process

under employment of any quantity of air. The process consists therein, that loosely packed metallic lead either granulated or in wire form is heaped up in a closed receptacle which is completely filled with liquid acetic acid and simultaneously air under pressure is introduced.

PROCESS OF MANUFACTURING FATTY COMPOUNDS FOR USE AS TURKEY-RED OILS.

Alexander Schmitz, of Heerdt, near Düsseldorf, Germany. Patent No. 861,397, dated July 30, 1907.

As is well known the Turkey-red oils manufactured by means of the known processes are defective in that they form insoluble lime-soaps upon being mixed with calcareous water, and that the unavoidable adherence of the very fine particles of such soaps to the yarn or fabric to be treated gives the latter a stained appearance.

In order to obtain fatty compounds which are not capable of causing insoluble lime-soaps to be separated out, the following process is used:

Take fatty oxyacid compounds obtained from fatty substances having the character of castor oil, that is to say castor oil itself, similar fatty oils and fats of the vegetable and animal kingdom or mixtures of castor oil, or similar fatty oils and fats with other fatty oils, fats or fatty acids, such as oleic acid, olein, ricinoleic acid and the like. These fatty oxyacid compounds are produced in the usual manner which is as follows: Castor oil or its desired substituent is sulphonated by means of sulphuric acid in the manner usual in the manufacture of Turkey-red oil; the sulphonation being completed, the product of the reaction is freed from adherent sulphuric acid by washing with water or an alkaline water, then separated from the under lye and continuously boiled either alone or with water in an open vessel until the sulphoacid compound formed in the sulphonating step is split up and the sulphuric acid completely disengaged from the oil. By this means the

oil is rendered completely insoluble in water and, as is known, is transformed into the corresponding fatty oxy-acid compound.

The fatty oxy-acid compound being washed thoroughly free from sulphuric acid and dehydrated is mixed in the mixing vat with castor oil or other similarly-acting fatty oils or fats and heated to 40—100° C. The mixture is allowed to cool to room temperature, when it is sulphonated with sulphuric acid as usual in the manufacture of Turkey-red oil; the sulphonation being accomplished the product of the reaction is washed clean from adhering sulphuric acid with water or an alkaline water, allowed to stand for some time in order to obtain complete separation, drawn off from the under lye and finally mixed with alkali so as to produce an acid or a neutral or a basic oil soluble in water according to requirements. If desired the oil drawn off from the under-lye may be transformed into soap by boiling it with an alkali.

PROCESS OF PRODUCING METAL PEROXIDES.

Franz Fuhrmann, of Berlin, Germany, assignor to Kirchhoff & Neirath Berlin American Commercial Company. Patent No. 861,826, dated July 30, 1907.

The present invention consists of a process of making chemically-pure metal peroxides by which all the advantages of hydrogen peroxide are also obtained when sodium peroxide is used as the starting material, and which consists in combining sodium peroxide gradually with a strong inorganic or organic acid, and permitting the so-obtained solution of hydrogen peroxide of a high percentage with a sodium-salt to act on salts of metal in presence of an alkali, as for instance ammonia. The presence of the neutral sodium salt does not impair the reaction. In place of the metal-salt and ammonia, the corresponding freshly-precipitated hydroxide or oxide of the metal can be used inasmuch as this is obtained primarily from a metal salt and an alkali. In this manner it is easily possible to produce in one operation hydrogen peroxide form sodium peroxide, and by the

action of the former on metal-salts the formation of the corresponding peroxide is the final product. The resulting products are fine, granular and easily filtering precipitates, which, owing to their chemical purity, are not inclined to decomposition in the same manner as the viscid products which are obtained by the direct action of sodium peroxide on metal-salts, and which can furthermore be produced by the use of the well-known simple filtering and drying appliances. This produces not only a considerable saving in the apparatus required, but also an important technical and economical effect for the reason that in place of the expensive concentrated hydrogen superoxide the cheap sodium peroxide can be used as the starting substance.

EXTRACTION OF POTASSIUM COMPOUNDS FROM FELDSPAR.

Aurelius J. Swayze, of Great Meadows, New Jersey. Patent No. 862,676, dated August 6, 1907.

This invention provides a process of expeditiously treating feldspar whereby it is rendered readily decomposable and silica, alumina, and potash may be separated therefrom.

Potash-feldspar in the naturally crystalline form as orthoclase is insoluble or but slightly soluble in solutions of caustic alkali. However, when feldspar (orthoclase) is highly heated in the form of a coarse powder or small particles, it is converted into an amorphous state, and it is then capable of being decomposed by a solution of a compound of potassium at a boiling or high temperature. It is now found that the amorphous feldspar is more readily decomposed in a solution of a potassium compound under pressure.

In performing the process, the orthoclase feldspar alone is crushed or reduced to small particles or a coarse powder. The material is next heated on the bed of a furnace, or in any other suitable manner, until the feldspar is converted from a crystalline to an amorphous state. The amorphous feldspar is next transferred to a boiler, or other suitable closed vessel, and mixed with

a solution of a compound of potassium, preferably with an aqueous solution of caustic potash, the solution being of specific gravity of about one- and two- or three-tenths. The mixture is then heated sufficiently to produce and maintain a high pressure in the vessel, and the heating continued until the solution attains a specific gravity of about one and seven-tenths, when it is saturated with the decomposed feldspar. The solution is next withdrawn from the vessel, and the elements separated by suitable methods.

MANUFACTURE OF SULPHOCYANIDE.

Joseph Tcherniac, of Streatham Hill, London, England. Patent No. 862,678, dated August 6, 1907.

A known method of absorbing cyanogen compounds from coal gas or like gas consists in passing the crude gas, preferably cooled and deprived of tar, through a suitable washer or scrubber containing milk of lime and sulphur.

The inventor has found that if it be desired to produce calcium sulphocyanide, or another sulphocyanide other than ammonium sulphocyanide, the above process is unsatisfactory, because the ammonia in the crude gas produces a large proportion of ammonium sulphocyanide the separation of which from the other sulphocyanide or sulphocyanides is difficult or costly.

According to this invention the crude gas is purified from its ammonia in the usual manner before it is passed through the washer containing the lime and sulphur.

It might be supposed that the lime ought to be present in very large excess in order that the sulphur may be completely converted into sulphocyanide; for in crude coal gas, freed from ammonia, the proportion of hydrocyanic acid to carbon dioxide is about 1 : 8 by volume, but the reaction of the hydrocyanic acid of the crude gas with lime and sulphur is so to say instantaneous, whereas the absorption of the carbon dioxide by the lime requires a longer time. Thus the excess of lime used need only be about two-thirds more than represented by the proportion 2S : CaO.

In practice, slaked lime and finely divided sulphur, the former in the aforesaid excess, are introduced together with the necessary amount of water into any known form of washer or scrubber preferably having means for agitating the liquid, and the gas, freed from ammonia but still containing sulphuretted hydrogen, is passed through the mixture in a systematic manner until all the free sulphur, or sulphur dissolved as polysulphide has entered into combination. This point is easily detected, inasmuch as when it is attained, the small quantity of iron sulphide which is inevitably present becomes converted into ferro-cyanide, so that the greenish black color of the mixture passes to a greenish yellow.

PURIFICATION OF ARSENICAL SULPHURIC ACID.

Julius Raschen, Arthur Edward Wareing, and Jeff Henry Shores, of Liverpool, England, assignors to the United Alkali Company Limited. Patent No. 863,940, dated August 20, 1907.

According to this invention the arsenical sulphuric acid, as it flows from the Glover tower is, after first being brought into contact with a reducing agent, such as charcoal, to reduce the arsenic compounds to the arsenious state, brought, in any suitable de-arsenicating tower, or vessel and at a temperature lower than the boiling point of arsenious chloride into contact with hydrochloric acid gas. A suitable temperature is between 90° and 100° C. By this operation arsenious chloride is formed, and nearly the whole of this will separate as an oily liquid when the sulphuric acid containing it is run into a suitable vessel. The sulphuric acid is preferably drawn off and subjected to the action of air which removes practically the whole of the remaining arsenious chloride not previously separated as oily arsenious chloride, the said sulphuric acid passing away in a purified condition, the arsenious chloride thus blown from the sulphuric acid passing into a scrubbing tower down which water is caused to flow, so that decomposition takes place between the arsenious chloride and water with the formation of arsenious oxide and hydrochloric

acid, which arsenious oxide is however contaminated with traces of selenium. To this mixture sufficient arsenious chloride, which had previously separated as as oily liquid from the sulphuric acid, is added to redissolve the whole of the precipitated arsenious oxide, when, on the addition of a little water, it will be found that the selenium is precipitated. The whole mixture is then filtered so as to separate the selenium and water is added to the clear liquid, to make the density of the solution equal to about 28° Twaddle, when about seventy per cent. of the arsenic is precipitated as arsenious oxide, and the whole is then filtered and washed, and the arsenious oxide is retained on the filter, while the hydrochloric acid solution, is returned to a vessel from which it is fed to one of the vessels, in which the sulphuric acid lies above the liquid arsenious chloride, or into other sulphuric acid, and the hydrochloric acid gas, which is liberated by contact with this sulphuric acid, is conducted to the tower, or de-arsenicating vessel, in which arsenious chloride is being formed from arsenical sulphuric acid, and thus the hydrochloric acid is circulated and re-used in the process.

PROCESS OF CONCENTRATING NITRIC ACID.

Richard Wolffenstein and Oscar Boeters, of Berlin, Germany. Patent No. 864,217, dated August 27, 1907.

The patent is based on the discovery that the concentration of nitric acid may be effected far more advantageously by means of nitrates capable of entering into chemical combination with water, such as calcium nitrate and magnesium nitrate. The advantage of this process in comparison with that generally used is based on the fact, that it saves the building and working of a sulphuric acid factory, and that the production of nitrous gases, which is liable to take place in the ordinary process through the action of concentrated sulphuric acid, is avoided.

The present process is carried out simply by dehydrating for instance the calcium-nitrate, at 150–200° C. and after cooling to about 50° C., pouring over it the nitric acid to be concentrated.

In consequence of this treatment the nitric acid is deprived of water, when the heating is renewed, and distils over in a concentrated condition, while the calcium nitrate re-absorbs water. If now the temperature is again raised to about 150 to 200° C., the calcium nitrate, remaining behind in the retort, yields up water (4 molecules) which it had absorbed, becomes anhydrous and may be used again for the extraction of water.

PRODUCTON OF AMMONIUM NITRATE.

Ernst Rudolf Caspari and Otto Nydegger, of Uerdingen, and Anton Goldschmidt, of Düsseldorf, Germany, assignors to R. Wedekind & Co., M. B. H. Patent No. 864,513, dated August 27, 1907.

The claim is for:

The process of producing pure nitrate of ammonium from nitrate of sodium and sulphate of ammonium, which consists in adding nitrate of sodium to a solution of sulphate of ammonium until the mixture is supersaturated with the former at a temperature over about 49° C., cooling this solution to the temperature of about 35° C. just above the saturation point of nitrate of ammonium, thereby crystallizing out most of the sodium sulphate and sodium nitrate drawing off the solution from the crystallized sodium salts, adding water equal to about one-fifth to one-seventh the weight of the solution, to keep the soda salts dissolved during the remainder of the process, cooling to about 15° to 20° C. thereby crystallizing out the ammonium nitrate and removing this nitrate of ammonium.

PROCESS OF TREATING WURTZILITE OR ELATERITE AND OF PRODUCING FUSIBLE SOLUBLE PRODUCTS.

William F. Doerflinger and Leon H. Buck, of Niagara Falls, New York, assignors, by Mesne assignments, to Marcus Stine, of New York, N. Y., and Edward F. C. Young. Patent No. 864,836, dated September 3, 1907.

When heated under ordinary conditions wurtzilite does not melt until a relatively high temperature is reached, but decomposes. The inventors have discovered, however, that when it is mixed before, or at the time of, heating with certain resinous substances it does not decompose but becomes fusible when heated to a comparatively low temperature, say 350° C. and after cooling becomes completely soluble in turpentine and other liquid vehicles. It is necessary that the resinous substance employed should be one which after treatment is itself soluble in the liquid vehicle to be thereafter employed, for instance, it may be gilsonite which is soluble in turpentine without heating, or it may be amber gum, which is not soluble in turpentine until it has been heated.

By this treatment the compound becomes suitable for use as a coating material to protect structures exposed to the weather, such as buildings, or to the water, such as vessels.

MANUFACTURE OF SULPHURIC ACID.

Frederick Gardner Cottrell, of Berkeley, California, assignor of one-half to Harry East Miller. Patent No. 866,843, dated September 24, 1907.

This invention consists in producing in the contact gases after coming from the contact mass, liquid particles of sulphuric acid representing substantially the whole of the sulphur trioxide formed in said gases by the contact mass, by suitably varying the humidity and temperature of said gases, and, in subsequently separating and collecting the liquid particles of sulphuric acid.

The process is distinguished from former practice, in that no attempt is made to directly absorb the gaseous sulphur trioxide; but, on the contrary, the gas is brought in contact with water vapor for the avowed purpose of producing the fog or mist, which most of the existing processes seek, in general, to avoid. The essential and fundamental condition recognized by the present process, whether the contact gases be treated with water in

any form, or, as a substitute therefor, dilute sulphuric acid, is that the water or dilute acid will rapidly give off aqueous vapor to the gaseous phase which vapor here unites in the gaseous phase with the sulphur trioxide to form sulphuric acid which is immediately condensed to liquid particles, if the temperature is not too high.

In carrying out the process, the original gases containing the sulphur trioxide are cooled to a moderate temperature, and are then either bubbled through, led over, or sprayed with water or with dilute sulphuric acid, to such an extent that the droplets of mist formed will have the desired composition which in practice will probably be chosen not far from 100 per cent. ordinary sulphuric acid. The choice of this composition will depend, among other things, upon the purpose to which the final product is to be put, the uses to which the residual gas is to be put, and questions of resistance of the materials of construction of the apparatus toward acid of varying composition. The fine liquid particles of sulphuric acid which compose the mist are separated and collected in any suitable manner.

PROCESS OF MAKING LACTIC ACID.

John A. Just, of Syracuse, New York. Patent 868,444, dated October 15, 1907.

Mix the whey or crude milk sugar solution with infusorial earth (silica), talc, asbestos, or other suitable mineral absorbent, and dry the mixture on a hot surface so constructed as to make a continuous operation, as for instance a revolving cylinder suitably heated to expel the water from the mixture. Sufficient earth is added to bring the mass to a consistency which will pass over the heated surface in a film. The film may be more or less thick as desired and the consistency of the mixture may be that of a creamy paste. The water is thus expelled and the albumen is coagulated, that is, the drying coagulates the albumen, which is then taken up by the mineral matter and held. On

leaching the dry, shavings-like product of the drying operation, a clear and nearly pure solution of milk sugar is obtained, this solution however still containing sufficient nutrients to enable the fermetation of the milk sugar and being eminently suited for this purpose as it is free from fat and solid coagulated proteid matter these insolubles having been taken up by the absorbent during the drying operation and not again given up to the leaching water. To this solution a suitable ferment is added, for instance rennet or rennet extract. The solution is maintained in any suitable manner at about 82° to 106° F. and sufficient rennet is added so that the smallest quantity will diffuse throughout the mass. Rennet contains numerous and active lactic organisms. A suitable alkali or alkaline earth like lime, for instance, in suitable form is kept present or else added from time to time to maintain the free lactic acid formed neutralized as fast as it forms, and thus prevent interruption of the process of fermentation by excess of acid. Chalk ($CaCO_3$) for instance may be used. The lactate of lime solution thus obtained is treated with sulphuric acid, for instance, or any other acid which forms an insoluble salt with the lime. Thus sulphate of lime insoluble in water is precipitated, while the lactic acid goes into solution. The sulphate of lime is separated by filtration and the diluted lactic acid suitably concentrated to a commercial strength.

PROCESS OF PRODUCING POTASSIUM COMPOUNDS.

Ralph H. McKee, of Lake Forest, Illinois. Patent No. 869,011, dated October 22, 1907.

This invention relates to the separation of potassium compounds from earthly materials, and more particularly from potash bearing materials containing mica in the forms in which these substances are found in nature.

It further relates to the production from the substances above mentioned of a soluble potassium salt, capable of use as a manure and also for manufacturing purposes.

It will be understood that the separation of potassium salts from materials containing mica is attended with some difficulty, owing to the insolubility of the silicious combinations which are involved in the raw material used. The inventor claims that when potash bearing material containing mica is heated in contact with lime and common salt, the calcium and sodium present unite with a part of the silicic acid, and the potash is left in the mass as a potassium salt, which is readily soluble in water. Further if the heating takes place in the presence of fuel, such for instance, as coal, oil or gas, this fuel facilitates the liberation of the soluble potassium salt. Instead of employing lime, an equivalent may be used in the shape of any substance which upon being heated produces lime. It is probable also that other alkaline substances analogous to lime may produce similar effects.

PARA-AMINODIPHENYLAMINE SULPHONIC ACID AND PROCESS OF MAKING THE SAME.

Ernst Erdmann, of Halle-on-the-Saale, Germany, assignor to Actien Gesellschaft für Anilin Fabrikation. Patent No. 869,073, dated October 22, 1907.

This invention relates to the manufacture of a new sulphonic acid of para-aminodiphenylamine it having been found that by acting on this amido-compound with "mono-hydrate" (sulphuric acid containing 100 per cent. H_2SO_4) or with a fuming sulphuric acid of suitable concentration, such a new sulphonic acid is obtained, whereas as is well known, by the action of the commercial sulphuric acid of 66° Bé. specific gravity on para-aminodiphenylamine sulphonation occurs only to a very small extent and with the formation of a large proportion of by-products. Moreover according to the present invention this new sulphonic acid of para-aminodiphenylamine is obtained with a good yield (75–80 per cent. of a theoretical yield) and without the occurrence of any considerable decomposition.

The reaction proceeds according to the following equation:

$$NH_2.C_6H_4.NH.C_6H_5+SO_4H_2= NH_2.C_6H_4.NH.C_6H_4.SO_3H+H_2O.$$

As to the constitution of the acid it appears to be the para-aminodiphenylamine-para-sulphonic acid:

$$\underset{(4)}{NH_2}.C_6H_4.\underset{(1)}{NH}.C_6H_4.\underset{(4)}{SO_3H}$$

STABLE DRY HYDROSULPHITE MIXTURE.

Alfred Rinckenberger, of Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 869,655, dated October 29, 1907.

In the specification of U. S. Patent No. 756,759 is described the production of stable dry hydrosulphite by filtering off the hydrosulphite which has been precipitated from, or salted out of its solution, then washing with a volatile liquid which is miscible with water, then removing, by evaporation in a vacuum, the washing liquid which clings to the hydrosulphite and then inclosing the hydrosulphite in an atmosphere of an inert gas. The inventor has discovered that a new composition of matter being a stable calcium hydrosulphite mixture can be produced if the calcium hydrosulphite (before, or simultaneously with, or after, being treated with a volatile liquid miscible with water) be suitably mixed with calcium oxide, or other oxide, or hydrated oxide, as hereinafter defined. The new composition of matter thus obtained possesses sufficient stability to satisfy practical requirements and does not require to be inclosed in an atmosphere of inert gas. It is a valuable reducing agent capable of very general application in the arts where reduction is to be effected. It can for instance be very well used in the indigo vat for reducing indigo.

PROCESS OF PRODUCING HYDROGEN PEROXIDE.

Richard Wolffenstein, of Berlin, Germany. Patent No. 870,148, dated November 5, 1907.

The inventor has discovered that the conversion of barium peroxide into hydrogen peroxide by means of carbonic acid takes place almost quantitatively if the barium peroxide and not the carbonic acid is maintained in excess. Under these conditions it was discovered that barium percarbonate forms, which is a new compound and comparatively stable. Working under these conditions therefore no foreign substance is deposited upon the barium peroxide and enveloping same, but the whole of the barium peroxide is converted into barium percarbonate. By the further action of fresh quantities of carbonic acid a further reaction takes place and the barium percarbonate already formed is split up into barium carbonate and hydrogen peroxide, probably with an intermediate formation of the water soluble barium bicarbonate. The whole process therefore occupies several phases, which to a large extent succeed one another in point of time, so that the course of the reaction may be followed analytically. The new process is also distinguished from that of Duprey by being carried out during the earlier stages in alkaline solution whereas according to the statements of Duprey the acid reaction of the carbonic acid prevails from the commencement.

The most important condition to be observed in the manufacture of hydrogen peroxide through barium percarbonate, is that the solution should be at first maintained alkaline and allowed to become acid only, when the decomposition of the barium percarbonate into hydrogen peroxide is ready to take place.

PROCESS OF MAKING ZINC FORMALDEHYDE HYDROSULPHITE.

Hans Labhardt, of Mannheim, Germany, assignor to Badische Anilin & Soda Fabrik. Patent No. 871,600, dated November 19, 1907.

In the specification of a former application it is stated that by passing a current of gaseous sulphur dioxide into a suspension of zinc dust in aqueous formaldehyde solution and, either by heating to a temperature of about 100° C., or by prolonged

stirring at ordinary temperature, a difficultly soluble zinc formaldehyde sulphoxylate can be obtained.

It is now discovered that the reaction can be carried out so that a product is yielded which is an easily soluble zinc formaldehyde hydrosulphite if the aforesaid components be allowed to react on one another while either cooling, or at ordinary temperature, or while avoiding strongly heating, in any case below 50° C., and the reaction be stopped before the difficulty soluble zinc formaldehyde sulphoxylate begins to separate out. If the treatment be prolonged, less of the readily soluble salt and some of the difficulty soluble salt are obtained.

PROCESS OF MAKING SULPHUR DIOXIDE.

John G. Jones, of Carthage, New York. Patent No. 872,822, dated December 3, 1907.

This invention relates to new and useful processes for producing sulphur gas (SO_2) from sulphur bearing ores, especially from iron pyrites, and consists essentially in the introduction into a rotary kiln, in which sulphur bearing ores are being roasted, of SO_2 gas produced by burning commercial sulphur in an auxiliary burner, thereby enriching the gas given off from the sulphur bearing ores.

It consists further in the process of causing crushed sulphur bearing ore to pass through a hopper surrounded by a heat dust chamber, whereby the fresh ore may absorb heat before entering a rotary kiln in which, as it is fed forward, it absorbs heat from the SO_2 gas which is given off from the ore in the burning zone of the kiln and, becoming highly heated in consequence thereof, is prepared to give off its SO_2 gas readily when it reaches the burning zone.

RECOVERING SODIUM SULPHATE AND SULPHURIC ACID.

Axel W. Nibelius, of Hackettstown, New Jersey. Patent No. 873,070, dated December 10, 1907.

This invention relates to a process of extracting or separating sodium sulphate and sulphuric acid from niter cake and has for its object to provide an improved process, whereby such extraction or separation may be easily, economically and satisfactorily carried out.

In this process the separation of the sulphuric acid from the sodium sulphate present in the niter cake is effected by dissolving the sulphuric acid in a volatile solvent or a mixture of volatile solvents in which the sodium sulphate is either wholly insoluble or only slightly soluble. As examples of such solvents may be mentioned ethyl alcohol preferably in the form of denaturized alcohol, methyl alcohol preferably in the form of ordinary wood alcohol, amyl alcohol in the form of fusel oil, and compounds of the said alcohols, as amyl acetate and the like.

PROCESS OF MAKING FORMATES.

Carelton Ellis, of White Plains, New York, and Karl P. McElroy, of Washington, District of Columbia. Patent No. 75,055, dated December 31, 1907.

It is the object of the present invention to produce metallic formates, and particularly those of the alkaline earth metals, by a simple, cheap and ready method enabling the production of large yields from cheap raw materials and delivering formates of more commercial value. For this purpose there is preferably used as a raw material a metallic carbonate insoluble in water, and particularly one of an alkaline earth metal; preferably a precipitated carbonate. Being insoluble in water, these bodies do not have the stated detrimental effect upon the produced formate, and a soluble of such produced formate can be withdrawn from time to time from the excess of base without danger of contamination by dissolved base. In the case of a precipitated carbonate, it is of an extreme fineness, such as could only be produced from the natural carbonates by laborious grinding. Such natural carbonates may however be used, though with less

advantage. In the case of calcium carbonate, the fine powder produced by air slaking lime may also be used. Fine division is very advantageous, although not absolutely necessary, as facilitating chemical reaction and as permitting suspension of the material in water to secure intimate contact of the three reacting bodies, carbon monoxide, water and base. The carbonate used will of course depend on the formate to be made, but ordinarily those of calcium, barium and strontium are to be preferred since these bases yield insoluble sulphates and oxalates and are therefore suitable for making formic acid. Lead carbonate is also suitable for the same reason. Lead oxide, zinc oxide or any other insoluble metallic oxide may be used in lieu of the carbonate. Calcium carbonate is however regarded as particularly suitable because of the low molecular weight of calcium and because the precipitated carbonate is readily available as a waste product in many arts, as for instance in the causticizing of soda, in the purification of water, etc. Magnesium oxide and carbonate are also suitable.

REFINING CARBON TETRACHLORIDE.

Charles E. Acker, of Niagara Falls, New York, assignor, by Mesne assignments, to Marcus Stine. Patent No. 875,232, dated December 31, 1907.

This patent describes a new and useful method of removing these impurities, either from crude carbon tetrachloride, or from impure carbon tetachloride, which has been imperfectly refined or purified by many of the well known ways, as by agitation with caustic potash or caustic soda solution. It consists in treating the carbon tetrachloride, preferably partially purified by any of the well known means, with an aqueous solution of hypochlorous acid or a salt of hypochlorous acid, as sodium, potassium or calcium hypochlorite, until the impurity is destroyed; the essential feature of the process consisting in reacting upon the impurities with a reagent containing the hypochlorous radical,

or, in other words, the radical of hypochlorous acid. It will be understood from the above that the chemical reaction resulting in the purification of the carbon tetrachloride is due to the reaction between the radical of hypochlorous acid content of the reagents above referred to and the impurities associated with the carbon tetrachloride.

PROCESS OF GENERATING FORMALDEHYDE.

Arthur Eichengrüm, of Düsseldorf, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co. Patent No. 875,415, dated December 31, 1907.

The inventor claims a new process of generating gaseous formaldehyde solution with salts of those peracids which are derived from metallic peroxides, having an alkaline reaction.

For this purpose salts of perboric acids, such as the perborate of sodium $Na_2B_4O_8.10H_2O$, salts of percarbonic acid, for example the percarbonate of sodium Na_2CO_4, salts of pertitanic acid, such as the pertitanate of potassium $K_4TiO_9.10H_2O$, salts of pervanadic acid, for example the pervanadiate of sodium, $NaVO_4$, salts of peruranic acid, such as the peruranate of potassium, K_2UO_5 salts of perzirconic acid, for example the perzirconate of sodium,

$$Na_4Zr_2O_{11}.9H_2O,$$

the salts of permolybdic acid such as the permolybdate of potassium $KMoO_4$, etc., may be used. Salts of alkaline earths, etc., may also be used. The reaction can be accelerated by the addition of fixed alkaline compounds, such as sodium carbonate, sodium hydroxide or the like. Instead of one salt of those peroxides, having an alkaline reaction, mixtures of such salts of different acids may be used.

PROCESS OF PURIFYING HYDROCHLORIC ACID.

Lewis B. Skinner, of Denver, Colorado. Patent No. 875,558, dated December 31, 1907.

The claims cover:

1.The process of purifying commercial hydrochloric acid mixed with free chlorine which consists in distilling the mixture and then reacting on the distillate with hydrocarbon gas, such as acetylene.

2. The process of purifying commercial hydrochloric acid mixed with free chlorine which consists in evaporating the mixture in a boiling flask, collecting the vapors in a closed pot, passing them on from the pot against gravity and condensing them.

PROCESS FOR SAPONIFYING PETROLEUM AND OTHER SIMILAR HYDROCARBONS.

François Josué Lothammer and Constant Trocquenet, of Paris, France, assignors of sixty one-hundredths to Edward Leon.

The claims cover:

1. The process of saponifying petroleum which consists in emulsifying petroleum which consists in emulsifying the petroleum by "*Quillaia saponaria*," igniting the emulsionized petroleum, collecting the residue resulting from burning the emulsionized petroleum, and finally boiling said residue with vegetable oil, soda lyes, an aqueous solution of silicate of soda and a solution of carbonate of soda in quillaia water.

2. The process of saponifying petroleum which consists in emulsifying the petroleum "*Quillaia saponaria*," igniting the emulsionized petroleum, collecting the residue resulting from burning the emulsionized petroleum, and finally boiling said residue with cocoanut oil, soda lyes, an aqueous solution of silicate of soda and a solution of carbonate of soda in quillaia water.

IV.—MACHINES.

APPARATUS FOR RECOVERING SULPHUR DYE-STUFFS FROM WASTE DYE LIQUIDS AND WASHING LIQUIDS.

Jean Schmitt, of Belfort, France. Patent No. 845,013, dated February 19, 1907.

This invention relates to an apparatus for recovering sulphur dyestuffs from wasted or exhausted dye-baths and from liquids which have been used to wash articles or goods dyed with such dyestuffs. Its object is to effect an important economy in the consumption of such a dyestuff and to permit a clear effluent to be discharged.

This apparatus consists of an open recovering-tank divided into low but large decanting-compartments, allowing the heavier particles of dyestuffs in suspension to sink down therein by their gravity and having between these compartments filtering-receptacles to retain the lighter particles of dyestuff, said receptacles containing a suitable filtering material and formed by two low and tight partitions adapted to be overflowed by the decanted liquid, and an intermediate higher partition with one or more openings at its lower part for the passage of the liquid. This combination of alternately-arranged decanting-compartments and filtering-receptacles not only accelerates the recovering operation, but it also avoids premature obstruction of the filtering material by the larger particles of the dyestuff, such larger particles having time enough to deposit themselves in the larger decanting-compartments. On the other hand, the recovering-tank being open in all its parts, the different compartments and receptacles are readily accessible, while the scant depth of these compartments and receptacles allows a ready examination of the flow of the liquid.

DYEING APPARATUS.

Paul Fontaine, of Troyes, France. Patent No. 846,462, dated March 12, 1907.

The present invention has for its object an apparatus for dyeing threads on bobbins.

The invention facilitates the formation of a completely-closed liquid circuit in which bobbins are mounted above the orifices of a perforated partition of a vat which on both sides of the partition communicates, respectively, with the suction and delivery of an exhaustion and feeding pump, the closing of the circuit being affected after the complete expulsion of the air by the liquid dye. The liquid dye, which is thus provided in constant quantity very exactly determined, is adapted to be forced through the bobbins alternatively from without to within and from within to without and always produce a correspondingly-defined tint. It will be certain with a bath of determined composition to reproduce at each operation the same tint if the apparatus is made to work during the same time at the same temperature and with the same alternation.

DYEING APPARATUS.

Henry Pattyn, of Paterson, New Jersey. Patent No. 846,940, dated March 12, 1907.

This invention relates to machines for dyeing, washing, mercerizing, or otherwise similarly treating silk skeins and the like, and consists in certain improvements having for their objects to render the machine more positive in action, to cause it to perform its work on the skeins with greater uniformity, whereby the treatment of the skeins is regular, and to reduce the power necessary to operate the machine.

The purposes of the invention are carried out by means of a complex machine. The claims cover the details of construction.

APPARATUS FOR DYING TEXTILE MATERIAL.

Otto Venter, of Chemnitz, Germany. Patent No. 847,383, dated March 19, 1907.

This invention relates to an apparatus for quickly drying textile material of any kind—for instance, loose material, spun goods, stacking material, cops, cheeses, slivers, &c.,—which is subjected to the mordanting process, bleaching process, &c., and is placed round perforated hollow cylinders.

The new feature of the invention consists in the hollow cylinders holding the goods to be dried being connected with a pipe in which a partial vacuum is produced by means of a suitable device and the space surrounding the hollow cylinders being formed as a drying-chamber closed off from the space outside, into which chamber a compressed-air pipe opens which maintains the air at a suitable excess pressure. By these means through the external excess pressure existing in the drying-chamber the moisture present in the goods to be dried is prevented from evaporating outward—that is, into the drying-chamber—and at the same time the water-vapors forming under the influence of the dry air are caused to escape into the vacuum-pipe. The result of this is that the air of the drying-chamber has no opportunity during the drying process to absorb moisture, and consequently the accumulation of water-vapor in the drying-chamber, which is detrimental to the drying process, is prevented.

DYER'S VAT.

Matthew C. Cuttle, of Norwich, Connecticut. Patent No. 853,627, dated May 14, 1907.

This invention relates to that class of dyers' vats which include an outer tub or vessel and a removable inner cage adapted to receive the goods to be dyed, and my object is to provide, in connection with such vats, means for readily forcing the dyeing solution through said goods in either direction, that is to say either downward through the cage containing the goods or upward through said cage.

The invention also comprises improved means for removably supporting the bottom of the cage as well as means for introducing the dyeing solution into the vat.

DYEING-MACHINE.

Napoleon Labonty, of Pawtucket, Rhode Island. Patent No. 853,700, dated May 14, 1907.

This invention relates to a machine for dyeing cops and has for its primary object a means for dyeing cops in large quantities in a short time.

A further object is to utilize the dyeing liquid for repeated use; and further, to afford facilities for maintaining or changing the temperature of the liquid. It is also desired to afford means for removing the sediment accumulating during the dyeing process.

To the above ends essentially the invention consists in providing a series of cop receptacles which are previous to the dyeing liquid, and reciprocating these receptacles in a tank containing dye liquors. It further consists of means for maintaining the dye liquors at a high temperature, and in other structural details descried at length in the claims.

WOOL SCOURING MACHINE.

Walter Oscar Milne, of Stockton, California. Patent No. 854,372, dated May 21, 1907.

The claim is for:

In a wool scouring machine, the combination of a vat, a fork comprising a shaft and tines, a carrier therefor, means for reciprocating said carrier horizontally, and means for rocking the fork shaft in the carrier, comprising an arm extending from said fork shaft, a roller carried by said arm, a cam rail in contact with which the roller travels on the forward movement of the carrier, a vibratable tongue in contact with which on leaving the cam rail the said roller travels in the forward movement of the carrier, a second cam rail in contact with which the roller travels in the rearward movement of the carrier, a vibratable

tongue in contact with which on leaving said second cam rail said roller travels in the rearward movement of the carrier, and means for suitably supporting said cam rails and vibratable tongues.

DYEING-MACHINE.

John R. Greenwood, of Boothwyn, Pennsylvania. Patent No. 854,417, dated May 21, 1907.

This invention relates to machines for dyeing, and equally well adapted for warps or piece goods; among its distinguishing features are the repassing of the material to be dyed through the machine in successive parallel courses, and the separation of the material both vertically and horizontally at each return of the courses, to thereby lessen the liability of its entanglement; also, the positive movement of the material is effected without undue tension upon it (thereby lessening the damage by breakages) by power driven rolls which carry the material and which are positively rotated in unison at uniform surface speeds, by an arrangement of means which control their movements in the directions necessary for the successive passing of the material through the dye until it is evenly and thoroughly colored, which must be done without expressing any dye from the material until its final passage from the machine. The expressing of any dye while the material in passing from one part of the machine to another part, and at a time when it is exposed to atmospheric conditions is detrimental to uniform coloring, and in this machine this heretofore defect has been overcome, most effectually, by the employment of a pair of final squeeze rolls which express the dye when the work is completed and at the time the material passes from the machine to the washery, also the nonpulling of the material through the machine, which insures uniform coloring, as the material is thoroughly dye saturated throughout the process. There is also, in this machine, a saving of a large amount of dye which is returned to the vat by the final squueze rolls. Where only one pair of squeeze rolls are employed, as in previous

machines, and the material must be pulled over non-power driven rolls, the capacity of the machine is limited by the tensile strength of the material going through the machine, and any bunching of the material, knots, etc., when forced through the former single pair of squeeze rolls produces uneven pressure and uneven expressing of the dye, resulting in spotting and uneven depth of color. These defects have been overcome by the power driven rolls which carry the material along without undue tension, and the final squeeze rolls which permit full and free saturation until perfect work is assured.

APPARATUS FOR TREATING TEXTILE FIBERS.

Robert G. Campbell, of Greensboro, North Carolina. Patent No. 856.029, dated June 4, 1907.

This invention descries a machine for the treatment of textile fibers, such as yarns and warp with especial reference to dyeing such fibers, has for its object economy in time, labor, and dyeing material. Starting with the fibers in the form of warp on beams it subjects them to the dyeing process while in transit through the vat, and again winding the warp upon other beams as it proceeds from the vat, in contradistinction to subjecting the material in bulk to the dye liquor or drawing the warp from cans, dyeing the warp and then discharging the warp from the vat into cans or boxes.

The claims cover the details of construction.

DYEING APPARATUS.

Louis Destrée, of Haren, Belgium. Patent No. 856,134, dated June 4, 1907.

This invention relates to improvements in dyeing apparatus and has for its objects the convenient manipulation of hanks of yarns connected in a continuous band, during the dyeing thereof, according to the process of dyeing described in the Belgium patent to Destrée *et al.* No. 171,532 of July 14, 1903. This

patent describes a complex machine for use in the yarn dyeing system invented by the above.

APPARATUS FOR APPLYING FLUIDS TO FABRICS.

Carl F. Kübler, of Düsseldorf, Germany. Patent No. 856,885, dated June 11, 1907.

The present invention refers to an apparatus for applying fluids such as solutions of dyes, colors, mordants, etching and bleaching-fluids by means of rolls, which distribute the fluid fairly even over the whole surface.

The object of this invention is to improve these apparatus in such a way that the fluid or liquor is applied so regularly and evenly as appeared impossible up till now. For this reason a number of rolls, which are driven at the same speed apply each on every part of their surface the same amount of color or other liquid to every part of the fabric to be treated.

RETURN-LIQUOR SYSTEM FOR DYEING AND BLEACHING MACHINES.

Robert P. Smith and George E. Drum, of Philadelphia, Pennsylvania. Patent No. 856,922, dated June 11, 1907.

This invention relates to certain new and useful improvements in dyeing and bleaching machines and it particularly pertains to return liquor systems to be employed in connection therewith.

In the arts as heretofore practiced, it has sometimes been the custom to allow the liquid used in bleaching and dyeing processes to run to waste. This mode of procedure has proven too costly to be practiced and various attempts have been made to eliminate this objection. Centrifugal pumps have been tried for the purpose of forcing the liquid, after it has been once used, into a suitable tank where it can be stored for future use, but this method has been abandoned as unsatisfactory, owing to the corrosive action of the various chemicals upon the rotating parts of the pump, which makes them too costly of maintenance in a working condition.

At the present time, it is sometimes the practice to allow the liquid to run by gravity into a suitable reservoir in the floor of the dye house in proximity to a dyeing machine or extractor and when it is desired to use the liquor again it is necessary to dip it from the reservoir with buckets, but this is a slow and tedious method and one which causes much work.

It is a desideratum of the present invention to eliminate the above objections and to this end the apparatus comprises a storage reservoir having inlet and outlet passages for the liquor and means for ejecting liquid under pressure from the reservoir.

APPARATUS FOR DYEING, BLEACHING, AND SIZING COTTON WARPS.

Jonathan Hartley, of Springfield, Massachusetts. Patent No. 858,068, dated June 25, 1907.

This invention relates to the art of dyeing, and more particularly to apparatus for dyeing warp threads.

The object is to provide a machine which will be capable of handling a large amount of material at one time and which will permit of either a succession of treatments or a single treatment.

Among the objects that may be mentioned specially are to provide for taking up slack in the threads as they elongate during passage through the apparatus, and to provide for ready access to, and adjustment of, the threads in event of a tangle.

This is a complicated machine and the claims cover the details of construction.

TRAY FOR STEAMING YARN.

William Edward Lyford, of Thompsonville, Connecticut, assignor to the Hartford Carpet Corporation. Patent No. 858,086, dated June 25, 1907.

The invention relates to the art of producing printed warp, such as is used by carpet manufacturers and others in the production of tapestry and other carpets, rugs and the like.

The object of the invention is to provide a new and improved tray for supporting printed yarn during the process of steaming the same, with a view to fix the color, the tray being arranged to allow the steam to readily penetrate all portions of the yarn in a comparatively short time, and to allow compact nesting of a plurality of trays for steaming a large amount of yarn in a comparatively small space.

The claims cover the details of construction.

COLOR-FEEDING ATTACHMENT FOR MACHINES FOR DYEING OR PRINTING IN SHADED COLORS OR TINTS.

Max Becke, of Höchst-on-the-Main, Germany, assignor to Farbwerke, vorm. Meister Lucius & Brüning. Patent No. 860,893, dated July 23, 1907.

In the machines for dyeing or printing in shaded colors or tints the colors are transferred by means of a sub-divided roller to the dyeing or printing rollers proper. These machines have the disadvantage that the several subdivisions of the color-trough hold only a small quantity of color, so that after a comparatively short length of the goods is passed through the machine, the colors become exhausted so that the transfer-roller cannot take up and transfer any more color. The machines have therefore to be stopped so as to replenish the color-trough with a new supply of colors.

The object of this invention is to furnish a color-feeding attachment for the dyeing and printing machines referred to, by which the several subdivisions of the color-trough are supplied from time to time without interrupting the motion of the dyeing or printing machines, so that the latter can be operated continuously without any loss of time in stopping and refilling the color-trough of the transfer-roller of the same.

For this purpose the invention consists of a color-feeding attachment which comprises a large receptacle or tank that is divided

by partition-walls into as many subdivisions or compartments as there are divisions in the color-trough, and means for raising or lowering said color-feeding receptacle so as to permit an intermittent supply of color to the different subdivisions of the color-trough of the transfer-roller and the continuus working of the dyeing or printing machine.

DYEING-FRAME.

William Hannah, of Paterson, New Jersey. Patent No. 861,649, dated July 30, 1907.

The invention relates to the dyeing of fabrics and the like, and it has reference particularly to the dyeing, in the piece, of such delicate loose- or open-weave materials as, for instance, chiffon, gauze, etc.

The object is to provide an apparatus whereby the goods may be securely held while undergoing the dyeing process in perfect condition for not only attaining the best dyeing effects but absolutely without permitting the goods to be subjected to influences, whether derived from the apparatus itself or from shrinking or the movement of the goods through the dyeing fluid, which would tend to spoil the texture or disarrange the weave.

The goods may be placed in the holding apparatus in a relatively large quantity and without requiring skilled labor or any great loss of time, and when so arranged in said apparatus the whole is in convenient form for introduction into a dye-tub and for such subsequent agitation therein as the dyeing process requires.

The essential consists in the construction of the holding bars which are made of wood or other suitable material having stout pegs projecting from one side at each end carrying a taut cord or wire for the purpose of holding the material to be dyed.

DYEING-MACHINE.

Robert P. Smith and George E. Drum, of Philadelphia, Pennsylvania. Patent No. 863,460, dated August 13, 1907.

The object of this invention is to provide a simple and efficient dyeing machine having provision whereby material to be dyed may be thoroughly subjected to the dyeing liquid, and expeditiously introduced to or removed from the machine.

This machine consists of a tank to contain the dye liquor which contains a receptacle for the material to be dyed. This carrier is hinged to the tank at one side so that it may be raised out of the liquor for the removal or other treatment of the material. A suitable circulating arrangement is provided for the dye liquor.

The claims cover the details of construction.

DRYING-CYLINDER.

James H. Whittle, of Worcester, Massachusetts. Patent No. 863,636, dated August 20, 1907.

The claims cover:

In a metal drying cylinder, the combination with a rotating cylinder, a hollow gudgeon for the admission of steam, and a stuffing box provided with a bearing for said gudgeon, a hollow cap closing the end of said stuffing box with a steam tight joint, and an exhaust pipe leading from the interior of the cylinder though said hollow gudgeon and connected with said hollow cap by a screw threaded joint.

2. In a metal drying cylinder, the combination with a rotating cylinder, a hollow gudgeon for the admission of steam, and a stuffing box provided with a bearing for said gudgeon, of a hollow cap closing the end of said stuffing box with a steam tight joint, and an exhaust pipe leading from the interior of the cylinder through said hollow gudgeon and said stuffing box and entering said hollow cap by a steam tight joint.

3. In a metal drying cylinder, the combination with a rotating cylinder having a hollow gudgeon, a stuffing box forming a bearing for said gudgeon, a hollow cap closing the end of said stuffing box, an exhaust pipe having one end attached to the hub of the

cap by a steam tight joint and connecting the interior of said cylinder with the interior of said hollow cap.

4. In a metal drying cylinder, the combination of a supporting framework, a rotating cylinder journaled therein and provided with hollow gudgeons, independent water and steam passages formed in the framework, said steam passage communicating with said cylinder, and a bent pipe connecting said water passage with the interior of said cylinder.

HORSE FOR DYEING ESTABLISHMENTS.

Jacob Knott, of Paterson, New Jersey. Patent No. 864,309, dated August 27, 1907.

This invention relates to an improved horse for carrying the silk or the hanks in dyeing establishments from one dye-vat to the other, said horse being constructed in such a manner that the dye liquid cannot attack the transverse bolts by which the longitudinal and transverse pieces of these horses are connected with each other.

The horse comprises a plurality of longitudinal ears, certain of which, preferably the outer or side bars, are made longer than the middle bars, so as to form handles, and of transverse tie-rods passing through the longitudinal bars, and wooden sleeves placed on said transverse tie-rods, said sleeves being seated at the ends in depressions in the longitudinal bars, the floors of such depressions being convex, and fitting into corresponding concaved depressions in the ends of the sleeves so as to make a tight rigid joint between the sleeves and the bars and to protect the tie-rods aginst dye-liquor.

DYE-JIGGER.

Willy Peters, of Düsseldorf, Germany. Patent No. 866,058, dated September 17, 1907.

The present invention relates to a new full-width dyeing machine constructed and working in the manner of the so-called

jigger for uniformly dyeing cloth in which the entire dye-liquor is introduced into the jigger vat, and the cloth during the whole operation dips equally deep into the bath.

The most essential feature of this new full-width dyeing-machine lies in the fact that the jigger vat contains several compartments, which together receive the same quantity of equally strong dye-liquor, which corresponds to the length of cloth to be treated; the latter is only led through certain compartments and to these the dye-liquor from the remaining compartment, or compartments is added by means of suitable devices during the passage of the cloth forwards and backwards.

The jugger vat is conveniently constructed so that the compartments containing the starting bath stand continually in communication with one another, but can also when desired be put into communication with the compartments for the compensating or feeding bath. This for instance is of advantage when the total dye-liquor is introduced or mixed.

The introduction of the compensating bath to the starting bath can be brought about by any suitable means. For example the space inclosing the compensating bath can be reduced, which may be carried out for instance by arranging the bottom, so that it can move, and connecting it with a device which operates the gradual, automatic, raising of the bottom. In this operation the compensating bath is made to pour uniformly over the compartment walls inclosing the same into the compartments for the starting bath.

APPARATUS FOR DYEING YARN-COPS.

John Frank Roberts, of New Bedford, Massachusetts, assignor of seventy one-hundredths to Joseph C. Nowell. Patent No. 868,699, dated October 22, 1907.

The claim is for:

An apparatus for dyeing yarn cops, consisting of an inclosed conical vessel; regulated fluid supply inlet at its upper portion; a regulated discharge at its bottom; the vessel being of such

form that a conical cop may be located in said conical vessel resting against its taper walls beneath the fluid supply opening and above the fluid discharge opening; a chamber being formed between said conical cop and said discharge; a perforated inverted cone located within the central portion of said yarn cop and closed at its base; whereby dye fluid is caused to flow through the yarn cop downwardly and radially when placed in the apparatus.

DYEING MACHINERY.

Jacob Sulzbach, of College Point, New York. Patent No. 871,376, dated November 19, 1907.

This patent describes a machine which provides improved mechanism whereby color or dye may be evenly distributed upon material, as for instance, threads, fabric or yarns passing through the machine, and from which the surplus color or dye may be evenly and effectively removed; and also covers mechanism for multi-color, variegated or shaded dyeing.

This invention is particularly useful in coloring threads, as for instance silk threads, which are intended for embroidery purposes, so that the thread will be shaded or variegated in color to enable various artistic effects to be produced, and the mechanism is so organied that the colors may be blended one into the other.

Various tints of the same color may be employed in the color applying devices or different colors may be used as occasion may demand. In the present instance there are shown a number of color distributers, each of which may have a different shade or a different color for distribution, and these may be applied serially. Or by means of a reversing driving mechanism, two of the shades or colors may be alternated one with the other for producing some desired effect.

DYEING-MACHINE.

Daniel F. Waters, of Philadelphia, Pennsylvania. Patent No. 872,597, dated December 3, 1907.

This invention relates to dyeing machines of the class described

in U. S. Patent No. 785,283, dated March 21, 1905, and comprising a series of rotary yarn sticks upon which yarn may be suspended while immersed in a dyeing solution.

The present improvement relates more particularly to the frames which carry the rotary sticks and to the means whereby said sticks are rotated to progress the yarn hung thereon.

The form of this invention comprises a frame wherein all of the yarn sticks are mounted to rotate in parallel relation, but the alternate sticks in said frame are connected for rotation in two distinct series. Each of said sticks is provided with a ratchet wheel, but the ratchet wheels of the respective series are upon respectively opposite sides of the machine, and there engaged by series of pawls corresponding with the respective ratchets and carried by respective reciprocatory bars. These bars are provided with means whereby they may be manually reciprocated independently of each other, so that either of said series of sticks may be rotated independently of the other. The claims cover the details of construction.

DYEING-MACHINE.

William H. Flecher, of Paterson, New Jersey. Patent No. 872,807, dated December 3, 1907.

This invention relates to improvements in machines for dyeing skeins of silk or other threads: and the objects of this invention are economy in construction and in liquid used; rapidity in loading and unloading the machine, and the prevention of tangles so that the threads will wind well.

The claims cover the details of construction of a rather complicated machine.

DYEING APPARATUS.

Frank Neville Patterson, of Lexington, North Carolina. Patent No. 875,553, dated December 31, 1907.

This invention is a machine or apparatus for dyeing, and

particularly adapted and intended for applying dyes to cotton or worsted yarns.

The object of the invention is to provide a dyeing machine or apparatus in which the dyestuff or liquid will be forced uniformly through the yarn, and then back to the supply vat for repeated use.

The apparatus includes a dye supply vat and pump, and pipe connections to a dyeing box containing cones on which the yarn is reeled, the yarn being uniformly held between the cones and surrounding perforated jackets, causing uniform resistance throughout the mass of yarn.

V.—MISCELLANEOUS.

PROCESS OF TREATING HIDES AND SKINS.

William M. Norris, of Princeton, New Jersey. Patent No. 840,794, dated January 8, 1907.

The claims are for:

1. The improvement in treating hides and skins, which consists in depilitating them in lime and arsenic and then subjecting them to the direct action of hyposulphite of soda and then to acid.

2. The improvement in treating skins which consists in depilitating them in lime and arsenic, subjecting them to the direct action of a solution of hyposulphite of soda to set the gelatinous fibers of the skins, then subjecting the same to the action of a solution of hydrochloric acid, salt and water, and then slating the stock.

3. The improvement in treating skins which consists in depilitating them in lime and arsenic, subjecting them to the direct action of a solution of hyposulphite of soda to set the gelatinous fibers of the skins, then subjecting the same to the action of a solution of hydrochloric acid, salt and water, then slating the stock, and then subjecting it to a slight tawing operation.

METHOD OF OBTAINING CELLULOSE.

Francis L. Stewart, of Murrysville, Pennsylvania, assignor of one-half to Samuel E. Gill. Patent No. 845,378, dated February 26, 1907.

This invention relates to the manufacture of cellulose from vegetable fiber, and is especially applicable to its production from the "chip stuff" or stalk substance remaining from the stalk of maize after the saccharine juice has been obtained therefrom according to U. S. Patent No. 811,523. The invention is, however, applicable to the conversion into cellulose of grasses or other plants similar in physical stucture to that of the maize.

For making pure refined cellulose the stalk material prepared as above is fed into a retort or boiler capable of being closed and heated. This vessel may be heated by steamjacket or in any other desirable way, and after the moist stalk material is fed in it is heated to a temperature of about 212° Fahrenheit, the cover is fastened down, and nitric oxide gas is injected through suitable pipe connection. At the same time a jet of live steam is injected through another pipe into the vessel or digester. The combined effect of these agents is to rapidly disorganize the chips and break up and resolve them into a form of cellulose. The amount of nitric oxide is preferably regulated, though an excess is not injurious to the product if the action is not unduly prolonged. The conversion of the whole mass is ordinarily accomplished in fifteen or twenty minutes, and enough of the nitric-oxide gas should be introduced with the steam to saturate the chips with a solution of the nitric oxide in water, which solution at the close of the operation should have a density near that of commercial nitric acid, or a specific gravity of about 1.4. After the conversion is made hot water is then admitted into the digester sufficient to cover the mass. This acid solution is then drawn off and may be tapped into a receptacle and treated with soda waste from the generating-retort and recovered as nitrate of sodium or nitrate of potassium, if nitate has been used. After the mass has been washed with the hot water any excess of acid

is neutralized with an alkaline substance. The mass is again washed and then preferably acidulated slightly with hydrochloric acid. It is then preferably washed free of acid, as indicated by the phenolpthalein test. Cellulose prepared in this manner is practically commercially pure and is adapted for all the uses in the arts in which a pure form of cellulose is desirable.

ADHESIVE COMPOUND, GLUE, &c.

Mone R. Isaacs, of Philadelphia, Pennsylvania. Patent No. 845,791, dated March 5, 1907.

This invention relates to adhesive compounds, glues, and sizings made from proteids, dextrine, or similar substance; and the objects of my invention are to regulate the set or hardening qualities thereof and to enrich, preserve, and improve the same and to render the resulting compound adaptable to a greater variety of uses in the arts than has heretofore been accomplished.

In carrying out this invention combine with caseine or any other suitable proteid, whether animal or of vegetable origin, suitable proportions of a solvent, a silicate, and fluoride. It is of course to be understood that when used either as a glue or as a sizing these ingredients are dissolved in a suitable quantity of water and reduced to the form of a liquid or semiliquid composition.

It is found that any of the following solvents are suitable for my purposes—viz., potassium borate, borax, trisodium phosphate, tripotassium phosphate, sodium carbonate, potassium carbonate, and sodium hydroxide.

The addition of a silicate to an adhesive compound, glue, or sizings made from caseine or other suitable proteid renders the same more or less waterproof and adds strength to the same. Any of the alkaline silicates—such as sodium silicate, potassium silicate, or ammonium silicate—are excellently adapted for the purpose.

The time within which the adhesive compound, glue, or sizing or similar substance made from caseine will harden or set may

be regulated by the addition of a suitable fluoride, the greater proportion of fluoride added acting to increase the time required for the compound to set, in addition increasing the flowing qualities of the same. The fluoride of sodium, potassium, or ammonium may be advantageously employed as one of the ingredients of my improved adhesive compound, glue, or sizing.

PAINT-REMOVER AND PROCESS OF MAKING THE SAME.

Peter T. Austen and Frederick J. Maywald, of New York, N. Y. Patent No. 846,080, dated March 5, 1907.

This is a generalized patent covering a combination of substances and alternates. It does not appear to describe any definite combination or specific formula. The most comprehensive of the fourteen claims appears to be No. 9 for:

A paint-remover comprising a fluid emulsion of a mixture of a plurality of volatile solvents of differing chemical character but comprising a petroleum hydrocarbon, and having substantially unimpaired solvent power in an aqueous carrier, said emulsion being creamy in character, flowable, free from caustic or corrosive components or free acids and consisting in greater part of said volatile solvents.

EFFERVESCENT LAUNDRY BLUING.

Elizabeth S. Yarnall, of St. Louis, Missouri, administratrix of Zachariah S. Yarnall, deceased. Patent No. 846,887, dated March 2, 1907.

The invention relates to a laundry bluing preferably made in the form of tablets, the object of the invention being to furnish a coloring substance in condensed form that will be effervescent when placed in water, whereby the coloring-matter will be fully and quickly diffused and disseminated to distribute evenly throughout the body of water in which it is placed without the necessity of mechanical agitation.

In producing the tablets a base is utilized consisting of soluble blue (preferably what is known commercially as "Tiemann's blue") and oxalic acid and bicarbonate of soda, which in combination with each other and in the presence of water serve to produce a gas by which the effervescing quality of the tablets is secured. The above-named ingredients constitute the main or fundamental agents of the bluing. To said agents is added wood-alcohol as a granulating agent, musilage of acacia as a binding agent, petrolene-oil as a lubricant, and boric acid as a non-adhering agent to prevent adhesion of the tablets in the process of pressing them into shape.

PAINT.

John Francis Villard, of Rexton, New Brunswick, Canada. Patent No. 847,384, dated March 19, 1907.

This invention consists of the combination of elements in the proportions substantially as specified herein.

To carry the invention into effect take ten parts of whiting and four parts of flour and cook the same into a paste with about sixteen parts of water and one-half part of glue. Then add eight parts of raw linseed-oil and four parts of melted rosin, mixing the same while hot. To these ingredients add one-half part of Burgundy pitch melted in linseed-oil. These two compositions are then carefully mixed with white lead and linseed-oil, and for the purpose of drying add brown japan. Coloring-matter is then added according to the shade desired. For fresco work and all inside work one part of beeswax is dissolved in two parts of turpentine and added to the mixture.

TOWER FOR SULPHURIC-ACID PLANTS.

Richard Cellarius, of Sergievskoi Posad, Russia. Patent No. 848,631, dated April 2, 1907.

This tower is constructed as follows:

A lead turret of about eighty inches diameter is mounted

between the chambers in such a manner that its bottom is placed about twenty inches higher than the bottom of the chambers. The turret is at its inner walls fitted with a layer of coke of about twenty inches in thickness, so that in the interior of the turret a space of about forty inches in diameter is left.

Instead of with coke the turret may be fitted with perforated ring-plates.

The gases are led into the lower part of the space left in the middle of the turret, while they are allowed to escape at the upper part of the turret.

A turbine with paddles is inserted in the middle space of the turret, while the hollow axle of the turbine passing beyond the turret is closed up against the top of the turret by a water seal.

ADHESIVE COMPOUND.

Mone R. Isaacs, of Philadelphia, Pennsylvania. Patent No. 848,746, dated April 2, 1907.

The object of this invention is to produce an adhesive compound or glue from any caseine or other suitable proteid and lime, which compound will not readily coagulate or disintegrate and in which a thorough distribution of the lime throughout the caseine is effected.

The compound is formed by combining caseine or other suitable proteid with lime, a suitable fluoride, and a compound of calcium and magnesium or a compound containing the silicates and aluminates of calcium and magnesium.

The proportions of the above ingredients which are mixed with caseine may be varied to quite an extent with slightly-different results. If a cement or glue which will set quickly is required, the quantity of the ingredients which are mixed with the caseine will be less than would be used in making a more slowly-setting glue.

TANNING COMPOUND.

James Benjamin Tompkins, of Vanderwoort, Arkansas. Patent No. 849,440, dated April 9, 1907.

The invention consists of a compound or solution formed of the following ingredients in the proportion stated, to wit: tannic acid or acidum tannicum, one pound; azedarach, or the bark of the tree known as the " Pride of China," one pound; gum-gambier, one one-pound; alum, one-half pound, and oil of cedar, two ounces.

In carrying the invention into effect the hides or pelts are first soaked in water until soft and then placed in a bating-bath consisting of one gallon of water containing approximately three pounds of lime and two and one-half ounces of bicarbonate of sodium.

The hides are allwed to remain in the bating-bath from three to fifteen hours, or until the hair becomes loose or slips, after which the hides are subjected to the usual depilating process to remove the hair and subsequently placed in a bath of fresh water for appoximately twenty hours, or until all trace of the lime and sodium is eliminated.

The tannic acid, azedarach, gum-gambier, alum, and oil of cedar are then placed in a suitable tank or vat containing two gallons of water and the hides or skins immersed in the solution and ollowed to soak until thoroughly tanned, thereby producing a superior quality of leather.

APPARATUS FOR NITRATING SULPHUR DIOXIDE.

Patrick J. Derrig, of North Weymouth, Massachusetts, assignor to the American Agricultural Chemical Company. Patent No. 850,820, dated April 16, 1907.

This invention relates to the manufacture of sulphuric acid, and is concerned particularly with improvements in the apparatus for nitrating or supplying the necessary oxides of nitrogen to the sulphur dioxide in the well-known lead-chamber process.

The novelty consists in a device to replace the "niter pots" which furnishes the nitrating material in the form of a solution. the supply of which can at all times be regulated in accordance with the requirements of the process and the residue of which material after nitrating has been effected may be conveniently conducted away and to a storage-receptacle.

ANTHRACHINONE DISULPHONIC ACID.

Michael Jljinsky, of Crefeld, Germany, assignor to R. Wedekind & Co. Patent No. 851,423, dated April 23, 1907.

This patent relates to the production of 1–7 anthraquinone-disulphonic acid according to the process of the inventor for sulphonating anthrachinone or other organic bodies, especially anthracene derivatives, in the presence of mercury (as such or in the form of mercury compounds), by which process the sulpho group or groups enter in other positions than by the sulphonating process only by means of sulphuric acid. It is now found that by this process the new 1–7 anthrachonone disulphonic acid is obtained by treating anthrachinone or anthrachinone mono-meta-sulphonic acid with sulphuric acid in the presence of mercury.

MANUFACTURE OF ARTIFICIAL THREAD FROM SOLUTIONS OF CELLULOSE.

Rudolf Linkmeyer, of Herford, Germany. Patent No. 852,126, dated April 30, 1907.

The present invention has for its object a process which permits of rendering cuproammoniacal solutions of cellulose directly utilizable for the precipitation of the cellulose in the form of threads, by a reduction of the proportion of ammonia that they contain.

Hitherto, in the ammoniacal oxide of copper processes, the whole of the ammonia has been left in the solution of cellulose in order to subsequently precipitate it in the form of a salt corresponding to the acid employed, when it was desired to solidify

the threads. The recovery of the ammonia contained in these salts (mostly acid) mixed with salts of copper, occasioned great expenditure and necessitated the employment of special processes for again liberating this ammonia. In the present process, this ammonia is in great part collected, in a gaseous state and chemically pure, by simple suction; it is therefore possible to immediately redissolve it in water. If it is considered that, in order to dissolve 1000 parts of cellulose, about 3000 to 3500 parts of ammonia are required, and further that, as a result of losses, there are used with the processes hitherto employed about 4500 parts of ammonia per 1000 parts of artificial thread, it will be obvious that the present process is of great practical value.

ACID COOLING AND GENERATING CHAMBER.

Iens P. Lihme, of Cleveland, Ohio, assignor to the Grasselli Chemical Company. Patent No. 852,390, dated April 30, 1907.

This invention relates to improvements in acid cooling and generating chamber employed in the manufacture of sulphuric acid, and provides means for more effectively generating said acid, and for very materially reducing the cost of the plant for manufacturing said acid.

These improvements are particularly applicable to an intermediate chamber designed to be positioned between the different acid chambers, which, by reason of the greater facility afforded for the union of the elements or groups thereof forming said acid, and for the ready release of nitrogen trioxide, serves not only to effect the desired combination or union more readily, but permits of a very material reduction in the size, area and cost of the lead chambers, while maintaining the gaseous elements at a much lower temperature, whereby the leaden walls of said chambers are preserved from attack.

The novelty of this invention consists in an intermediate chamber of an acid producing plant; the same comprising series of ventilating pipes or passages and alternating acid-generating or

condensing cellular partitions, through which the gaseous elements are passed to effect their cooling, subsequent combination or conversion into acid, and release of the combining medium.

PROCESS OF TREATING CASEIN AND COMPOUND OBTAINED THEREFROM.

Julius Taluau, of Philadelphia, Pennsylvania, assignor of one-half to Charlton H. Royal. Patent No. 852,915, dated May 7, 1907.

This invention consists of a process of treating the caseine in its liquid form, suitable then as a size, adhesive, or as a paint constituent, whereby decomposition is prevented, and its normal condition is maintained for an indefinite period.

The process or treatment consists in combining with such caseine a solution of gum camphor, which is prepared in a suitable manner for admixture therewith. To the solution of camphor may be added, under certain conditions, a small proportion of formaldehyde (CH_2O) being the 40 per cent. solution of commerce known as "formaline."

In carrying out the process, proceed substantially as follows: prepare the camphor solution by dissolving one part of gum camphor in thirty-two parts of methyl-alcohol. Then dissolve twenty-four parts of dry or powdered caseine in 128 parts of water, previously rendered alkaline to effect solution of the caseine by the addition of a small quantity of borate of soda, or ammonia as may be most convenient or desirable. To this solution of caseine, add four parts of the camphor solution, and the mixture thus prepared is subjected to heat that is gradually raised to 170° F., then cooled, and is then ready for use.

TREATING HIDES OR SKINS.

Samuel K. Felton, Jr., of Philadelphia, Pennsylvania. Patent No. 853,166, dated May 7, 1907.

The object of this invention is to so conduct the process of unhairing hides or skins (including in this term the treatment

preceding "puring" or "bating") that the process will be improved and shortened and the hides or skins will be in better condition than usual for the bating and subsequent treatments, and the finished leather will be tougher, stronger, and cleaner than leather produced from hides or skins otherwise treated.

In this process a compound of lime and sodium sulphide is applied to the flesh side of the skins and the hair then removed. The unhaired skins are then treated with sodium sulphide and washed alternately. They are then treated with the solution of a salt that will give off sulphur dioxide in the presence of acid as hyposulphite of soda. The skins are then finished in a bath of lime and arsenic.

PAINT AND VARNISH REMOVER.

John F. Dickson, of Binghamton, New York. Patent No. 853,685, dated May 14, 1907.

This invention relates to a composition for the removal of all kinds of paints, varnishes and shellac.

This invention relates to a compositon for the removal of benzol, comm'l toluol, acetic acid, benzine, spermaceti, paraffine wax will accomplish the purpose in a satisfactory manner.

It is found that the most satisfactory proportions are as follows: acetone 8 gallons, 90 per cent. benzol 2 gallons, commercial toluol 2 gallons, acetic acid 1 gallon, 67 per cent., benzine 1 gallon, paraffine wax, 2 pounds, spermaceti, 2 pounds. The most effective manner of mixing these ingredients is to place the spermaceti and paraffine wax in a tank of benzine which is thoroughly agitated until all lumps have disappeared and then add the acetone, benzol, toluol, and acetic acid, when with a few minutes further agitation the remover will be ready for use.

PROCESS OF EXTRACTING COTTON-SEED OIL.

Maurice Bird, of Sugar Land, Texas. Patent No. 853,759. dated May 14, 1907.

The object of the invention is to separate the cotton-seed oil from the hydrocarbon solvent in the form of soap, whereby the operation of separating the cotton-seed oil and hydrocarbon by distillation is avoided; the hydrocarbon is separated from the cotton-seed oil in such clean and pure condition that it can be used over and over again in the process; and an excellent quality of soap is produced.

The improved process of this invention consists of the following steps: First, the cotton-seed oil is extracted from the cotton-seed product, such for example as cotton-seed meal, with the use of a hydrocarbon solvent such for example as kerosene. Second, the solution of the cotton-seed oil and hydrocarbon solvent is mixed with a solution of caustic-soda or other soap making alkali, and heated, preferably in a closed vessel to prevent the volatilization of the volatile ingredients of the hydrocarbon solvent. The cotton-seed oil during this heating operation saponifies with the caustic-soda, or other soap making alkali forming a solution of soap which settles below the hydrocarbon solvent and is separated from it completely by a clearly drawn line. The soap is then drawn off and is ready for any suitable refining process, which forms no part of the invention. After the soap is drawn off the hydrocarbon solvent is ready for use in extracting another quantity of cotton-seed oil from the cotton-seed product.

PROCESS OF RENDERING MANILA COPAL, &c., INSOLUBLE IN OIL.

Willy Baringer, of Berlin, Germany. Patent No. 854,071, dated May 21, 1907.

This invention relates to a method of preparation of polishes from Manila copal, sandarac and similar resinous substances. The attempts already made to employ such resins in place of the more expensive shellacs have invariably resulted in failure in consequence of the fact that these resins even at ordinary temperatures combine with the oil of the polishes to form a

greasy and sticky mass, for which reason it is not possible to distribute them over the surface to be polished as evenly as an alcoholic solution of shellac can be distributed with the help of a little oil. By means of this process the above mentioned resins are rendered insoluble in oil, and become suitable for the purpose in question since they then act similarly to shellac and do not require more oil than shellac in polishing.

The process consists in intimately mixing Manila copal, sandarac and other resins, which dissolve in alcohol, with from 1 to 5 per cent. of a fatty oil, heating the mixture slowly until it becomes viscous and keeping the viscous substance for from ½ to one hour in this condition while constantly stirring it. Especially drying oils have been found suitable for the purpose, the temperature to which the mass is to be heated being about 200° C.

CELLULOSE ESTER.

Harry S. Mork, of Boston, Massachusetts, assignor to Chemical Products Company, of Boston, Massachusetts. Patent No. 854,374, dated May 21, 1907.

This invention relates to the manufacture of organic esters of cellulose, and particularly to the production of cellulose esters of the fatty acids in which through the exercise of my invention there is substantially retained the fibrous, or other form of the original cellulose structures from which they were derived.

For this reason, together with the fact that by the process the ester may be and preferably is produced at the normal temperature, the production of organic esters of cellulose of a quality and structure hitherto unknown and with wholly new properties and possibilities for constructive purposes is rendered easy. It is with these new sorts of organic esters of cellulose that the invention is particularly concerned, although it is also directed to and involves the method of their preparation.

The inventor claims that esterification may be effected at the ordinary temperature in a bath or medium in which the resulting

ester is insoluble, provided that the normal or ordinary cellulose is first converted into a characteristic form of hydrocellulose by a previous treatment. Such a bath or medium is produced by incorporating with the esterizing mixture, as an essential element thereof, a relatively large proportion of benzol or other liquid which is a solvent of the reagents primarily concerned in the esterification and a non-solvent of the desired ester. The benzol or its equivalent thus incorporated in the bath not only serves to dilute the esterizing agents and thereby restrain and moderate the velocity of the reaction, thus insuring more complete control thereof and avoiding the otherwise drastic action of the reagents upon the aggregated cellulose molecules, but also prevents the ester from passing into solution in the bath, the process conserving, in the product, the structure of the original cellulosic raw material and avoiding the degradation of the ester which always and necessarily occurs when it is dissolved even at the ordinary temperature in the powerful reagents involved in its production.

MANUFACTURE OF VISCOSE.

Montgomery Waddell, of New York, N. Y., assignor, by mesne assignments, to Silas W. Pettit. Patent No. 855,213, dated May 28, 1907.

This invention is especially valuable in the manufacture of viscose (cellulose xanthate), which is particularly adapted to form the filaments commercially known as lustra-cellulose or artificial silk. U. S. Patents No. 622,087, and No. 716,778, contain descriptions of typical and convenient methods of obtaining such filaments.

The process described is as follows: submerge alkali cellulose in carbon bisulphide in a vessel which is maintained hermetically sealed until the treatment is completed. Then drain off as much as possible of the carbon bisulphide and cover the remaining cellulose xanthate with an aqueous solution of sodium hydrate, of the strength and proportion required to render said xanthate

of the required consistency for forming filaments. During the treatment of the mass with sodium hydrate, the excess of carbon bisulphide, remaining from the draining operation aforesaid, is removed by means capable of forming a partial vacuum within the closed vessel. The vapors thus liberated and removed from the mass within said vessel, being entirely free from air, can be readily condensed and prevented from issuing into the atmosphere.

During the treatment it is advantageous to agitate the same and this may be conveniently effected by rotary agitation.

This process is advantageous in that viscose produced is more uniform than viscose produced by the older methods, because it is at all times immersed in a liquid which excludes the cellulose from contact with air, and, as above noted, the present process permits complete control of the noxious vapors liberated from the mass under treatment.

APPARATUS FOR CONCENTRATING SULPHURIC ACID.

Antonio Gaillard, of Barcelona, Spain. Patent No. 856,048, dated June 4, 1907.

This patent describes an apparatus for the concentration of the sulphuric acid, which consists of a vertical chamber, the lower part whereof communicates with a furnace in which by the combustion of coke a stream of hot air is produced. The upper part of the chamber communicates with a pipe which conveys the sulphuric acid to be concentrated and throws it into said chamber in a fine spray. The bottom of the chamber is perforated and is placed upon a receptacle into which the concentrated sulphuric acid flows and in which there is a serpentine pipe of cold water to cool the sulphuric acid. The upper part of the chamber communicates with a lead receptacle filled with coke for the condensation of the sulphuric acid which may be carried along by the air stream. Thus the pure air flows out from the

low part of the concentration chamber toward a chimney which regulates the air stream through the apparatus.

The object of the apparatus is to fill the chamber with sulphuric acid in the form of spray in order to bring it into contact with the hot air coming from below, and thus obtain a quick evaporation or concentration of the sulphuric acid which drops in the receptacle at the base of the chamber where it is cooled.

APPARATUS FOR MAKING BISULPHITE LIQUOR.

Noble Heath, of Antioch, California, assignor of one-fourth to Walter S. Wright, and one-fourth to James W. Stewart, of Chicago, Illinois, and one-fourth to John H. Winslow, of Glencoe, Illinois. Patent No. 856,195, dated June 4, 1907.

This invention relates to improvements in apparatus for the production of bisulphite liquor.

The object is to provide such an apparatus for preparing bisulphite liquor, especially for use in digesting wood pulp for the manufacture of paper, which apparatus may be operated continuously, rapidly and economically to produce a high grade product, and which shall operate to more completely utilize and absorb the sulphur fumes or like element, and which shall be compact and economical of installation and operation.

PROCESS FOR THE MANUFACTURE OF THREADS, FILMS, OR OTHER FORMS OF CELLULOSE.

Max Fremery, of Oberbruck, and Emile Bronnert, of Mülhausen-Niedermorschweiler, Germany, and Johann Urban, of St. Polten, Austria-Hungary. Patent No. 856,857, dated June 11, 1907.

The present invention consists in the application of the discovery that when an ammoniacal cupriferous solution of cellulose prepared at a low temperature, that is to say, at a temperature below 10° C., as described in Patent No. 617,009, is subjected through a suitable opening, such as a slit or a comparatively wide cylindrical orifice into a strong caustic alkali solution. that

is to say, a solution having a specific gravity between 1.280 and 1.320; the film produced in one case and the thick thread in the other are brilliant, strong and elastic, and are moreover, waterproof even when they have been washed with acid to remove the copper they contain. Thus the thick threads made in one operation, that is to say, without spinning several fine threads together as has been customary heretofore, are excellently suited as substitutes for horse-hair.

PRODUCTION OF PRINTING-INK PIGMENTS.

Peter Fireman, of Braddock Heights, Virginia. Patent No. 857,044, dated June 18, 1907.

This patent describes the production of iron pigments in which the proportion of the ferrous to the ferric iron is considerably larger than 1 to 2. The inventor claims this is an entirely new discovery and, because of the well known avidity of ferrous oxide, in a free state to take up oxygen and pass over into the state of ferric oxide was not to be anticipated from anything before known to those versed in the art. The discovery has developed a series of ferro-ferric oxides, which are of great stability and which have the physical properties above referred to, even though ranging between the ratio of 1 : 0.5 up to the limit of 1 : 2. These pigments have a composition wherein the proportion of the ferrous oxide to the ferric iron is greater than is represented by the formula FeO,Fe_2O_3. The series constitutes a new industrial product, never produced heretofore and particularly adapted to the production of black printing inks.

MANUFACTURE OF ANTIMONY COLORS.

Léon Brunet, of Brioude, France. Patent 857,978, dated June 25, 1907.

This invention relates to improvements in the manufacture of antimony and arsenic colors, such as white antimony colors or antimony ceruse, and yellow and red sulphide of antimony.

In this process the pyrites are roasted as usual, but the gases—sulphurous acid and excess of air, smoke, and soot,—after being passed into a chamber where the smoke (or soot) is deposited, are drawn forward by a strong draft created by a fan. They then pass between the arms of this fan, and the saline solution, such, for instance, as sulpho-antimoniate of barium (it would be the same thing with sulpho-arseniate of barium) is introduced through the hollow trumnions of this apparatus. The sulpho-antimoniate of barium thus penetrates by the trunnions and owing to centrifugal force passes along channels formed in the wings of the fan. The liquid is projected in the form of rain, almost like dust, which mixes with the sulphurous anhydride which passes through the wings. At this moment, the reaction is produced—and it always takes place, as seen, in an acid medium. This very important condition is the cause of the success of the operation. The reaction is as follows: Sulpho-antimoniate of barium added to sulphurous acid added to air, produce hyposulphite of barium added to yellow sulphite of antimony. The formula is as follows:

$$Sb_2S_8Ba_3+3SO_2+3O=3S_2O_3Ba+Sb_2S_5$$

From this equation it will be seen that no H_2S is given off. The precipitate is absolutely pure. The spray projected by the fan falls on the floor of the chamber; from thence it passes into a basin where it rests and the yellow precipitate separates itself from the solution of hyposulphite. It is decanted in the ordinary way, the precipitate is strained and dried in any suitable manner. It is evident that the residual product is very valuable: hyposulphite of soda being utilizable in many ways, more particularly in the same industry of antimony colors for preparing vermilion.

WATERPROOF PAINT.

Rudolf Plönnis, of Berlin, Germany. Patent No. 858,536, dated July 2, 1907.

In making this waterproof paint, water-glass in the form of

an undiluted, or only very silghtly diluted, commercial solution of about 40° Bé. is mixed with alkaline lye of about 40° Bé., the proportions being about 6 to 8 parts by weight of waterglass solution and 2 to 4 parts by weight of alkaline lye. If to this mixture mineral or metal pigments are added, paints of great body are obtained, which remain for a sufficiently long time so liquid that they can be very easily laid on, this property being due to their high percentage of caustic alkalies. The spreading-qualities can be increased by the addition of varnish, linseed-oil, or turpentine-oil, preferably of about 5 per cent. The paints with these pigments are soluble in water. If, however, there is added to the pigment about 1/5 to 1/2 its weight of cement, the paint is rendered not only weatherproof, but also proof against alkalies and acids. The paint also effectively protects articles coated with it from burning.

The improved paints are suitable for application to metals, which can be thus protected from oxidation, to wood, cement- and ordinary plastering, fabric, paper, pasteboard, etc. In a state of greater consistence the paints may be employed for pasting down linoleum, etc., for cementing purposes, for covering floors, etc.

PAINT COMPOUND.

John C. Perry, of Corte Madera, California, assignor of one-half to James U. Hastings, of Haywards, California. Patent No. 858,824, dated July 2, 1907.

The object of the invention is the production of an asphaltum paint having the quality of withstanding intense heat without blistering and cracking, thereby rendering it especially valuable as a covering for the surface of boilers, furnaces, and smoke-stacks, although it is equally as well adapted for the painting of iron or metallic surfaces generally irrespective as to the use to which the same is placed, likewise as a covering for exposed wood surfaces.

The improved asphaltum paint consists of the following ingredients, combined in approximately the proportions stated for a mixture of one hundred gallons, viz.: mineral wax 2 gallons, asphaltum 27 gallons, acetone 14 gallons, distillate 57 gallons. These ingredients are thoroughly mixed by agitation in any well known form of an agitating apparatus.

APPARATUS FOR CONCENTRATING SULPHURIC ACID.

Antonio Gaillard, of Barcelona, Spain. Patent No. 859,757, dated July 9, 1907.

The apparatus in general is composed of a vertical tower which stands inside of a receptacle or tank in which the concentrated acid accumulates. Near the bottom of this tower is located a perforated plate of refractory material which separates the concentrated acid from the hot gases inside the tower.

The invention comprises an inner coating or wall of refractory stone for the lower part of the tower, which may be changed without disturbing the tower, and which is interlocked at the top with the outer coating or wall; a perforated refractory plate above the bottom of the tank in which the concentrated acid accumulates in order to protect this tank from the action of the hot acid; an outer receptacle surrounding said tank and in which said tank rests, said receptacle being provided with cooling means; and at the upper part of the tower a movable cover closed by a hydraulic seal through which enters the pipe through which the acid to be concentrated is sprayed, and through which cover the outlet pipe for the gas leads.

SULPHURIC-ACID CHAMBER.

Oscar H. Eliel, of La Salle, Illinois. Patent No. 860,968, dated July 23, 1907.

The invention relates more particularly to the acid chambers and the flue and jet appliances in conjunction therewith; and

the objects are, first, to provide a chamber, or a series of short connected chambers or compartments arranged side by side, so as to be operated from one end by introducing the sulphurous gases and vapors at one end or side, circulating them back and forth, and passing them out at the same end or side, instead of a single chamber into which the gases are introduced at one end or side and passed out at the opposite end or side, as is commonly done; second, to provide means for causing the fumes and gases to pass to and fro in the chamber, or series of chambers and successively through the several chambers or compartments of the series; and third, to arrange the flues and jet appliances so as to produce a better circulation of the gases in the chamber or series of chambers than heretofore.

The claims cover the details of construction.

STABLE HYDROSULPHITE MIXTURE AND METHOD OF MAKING SAME.

Wilhelm Majert, of Berlin, Germany. Patent No. 861,218, dated July 23, 1907.

The inventor has found that the hydrosulphites are rendered exceedingly stable and their decomposition practically obviated when a small amount of caustic alkali or of a so-called neutral salt of an acid weaker than sulphurous or hydrosulphurous acid, such as a carbonate, borate, basic phosphate, etc., is added to the hydrosulphites. The following experiments demonstrating this fact were made. Six solutions were made each containing an equal proportion of sodium hydrosulphite. Solutions *a*, *b* and *c*, contained only hydrosulphite of sodium. Solution *d* contained also some sodium carbonate: solution *e* some di-sodium phosphate: and solution *f* some sodium borate. Solution *a* consumed 18*cc* of a solution of ferrocyanide of potassium with an addition of sodium hydroxide. Equal quantities of the solution *b*, *d*, *e* and *f* were heated in the same water bath. Solution *b* was totally decomposed in a quarter of an hour, whereas the solutions *d*, *e* and *f* showed no signs of decomposition even after hours.

The solution *a* remained standing in the cold and was likewise completely decomposed overnight ; it smelled strongly of dioxide of sulphur just as after heating the solution *c*. The favorable effect of the continued presence of the free alkali and of the salts which have an alkaline reaction was thus clearly proven.

To secure the hydrosulphite in commercial form as a paste or powder, the solution is evaporated in a vacuum, and carry the same as far as desired. The resultant product contains in the same proportion as when in solution, the acid by which the hydrosulphite is rendered stable.

PAINT.

George W. Allen, of Riverside, California. Patent No. 862,692, dated August 6, 1907.

The invention comprehends essentially the use of California crude oil of asphaltum base as a body or vehicle to which is added graphite to give it the qualities to resist the elements, a drier, a suitale thinner, and appropriate coloring matter.

Crude oil, graphite and a drier enter into all my formulæ, and the proportions vary somewhat according to conditions. By crude oil is meant crude oil of asphaltic base, and of from 8° to 20° gravity Baumé. The qualities given to the paint by the use of the crude oil, are elasticity and resistance to the elements, especially moisture. The purpose of the graphite is to give added elasticity and also render the paint still more resistant to the elements, especially heat. The more graphite there is the more elastic the paint will be and the less liable to crack. The amount of graphite to be used to a gallon of crude oil varies from a quarter of an ounce to six ounces, according to the amount of elasticity desired, and according to the conditions under which the paint is to be applied. The graphite has a quality of not only rendering substances waterproof to which the paint is applied, but it resists the heat of the sun or the heat arising from boilers, and so keeps the paint from running. The more graphite that is used the better it resists the heat and moisture.

PAINT COMPOUND.

Alexander A. Eberson, of St. Louis, Missouri. Patent No. 862,888, dated August 13, 1907.

This invention relates to a new and useful improvement in paints or coloring pigments, the object being to impart to the finished product the properties and characteristics of red lead and to avoid the disadvantages connected with the use and manufacture of pure red lead.

The compound consists of 500 pounds of red lead and 1,000 pounds permanent red colored barytes having a fixed color corresponding to that of the red lead, thoroughly mixed with 5 pounds sal-soda dissolved in 20 gallons of water and 5 pounds borax dissolved in 20 gallons of water.

FORMING FILAMENTS OUT OF VISCOSE OR SIMILAR VISCOUS MATERIAL.

Charles A. Ernst, of Lansdowne, Pennsylvania, assignor to Silas W. Pettit. Patent No. 863,793, dated August 20, 1907.

The object of this invention is, first to produce a viscose which does not require to be "aged" but will coagulate immediately upon its injection into a weak acid bath, although the viscose be fresh, and to preserve the viscose, and second to check the action of the carbon bi-sulphide so as to store the same until it is needed for spinning, without producing any undesirable results. The first of these results is obtained by dissolving a suitable quantity of a neutral salt in the solvent for the cellulose xanthate, before the cellulose xanthate is added thereto. In other words dissolve cellulose xanthate in a solution of caustic soda or of any other suitale solvent containing a soluble salt. It is found that the salts of sodium are particularly adapted to the purpose and sodium-carbonate, sodium-sulphite, sodium-silicate or any other similar salts may be used, since they impart to the viscose the property of coagulating immediately when ejected into a weak neutralizing bath.

The second object, namely, that of checking the further action of the carbon bi-sulphide upon the cellulose and to combine with those impurities in the viscose, which would otherwise discolor the same, is accomplished by adding to the solvent for the cellulose xanthate a suitable quantity of a neutral salt, preferably a soluble sulphite. In actual practice sodium sulphite is found to be particularly applicable for the purpose.

In carrying out the process dissolve cellulose xanthate in a weak solution of caustic soda to which has been added a suitable quantity of sodium sulphite and to coagulate the viscose into filaments by spinning them into a neutralizing bath composed of sodium bi-sulphite, which is sufficiently acid for the purpose of coagulating the viscose and is not so expensive as to make the process commercially impracticable.

PROCESS OF RETTING OR DEGUMMING FIBROUS MATERIAL.

Charles Robert Rogers, of South Melbourne, Victoria, Australia. Patent No. 864,565, dated August 27, 1907.

This invention consists of an improved process of retting or degumming and subsequently cleaning and drying fibrous plants, stalks, leaves, and straws, and the like, such as linum, phormium, ramie, sisal, hemp, etc., preparatory to breaking and scutching the same to obtain the fiber therefrom.

This process consists essentially in effecting the retting or degumming by boiling the material to be treated in a vat containing water to which has been added an emulsion of linseed oil. When the material has been sufficiently boiled which is indicated by its sinking beneath the surface of the water in the vat, it is removed and passed between three or more sets of squeezing rollers. While passing between the first set, the material is sprayed with water to which has been added some of the same emulsion of linseed oil as used in the boiling operation. The material then passes between each of the further sets of

rollers and in its passage therethrough it is sprayed with water alone with the result that when it leaves the last set of rollers any gummy matter left in the material after the boiling operation, together with any fleshy matter has been removed and the material then passes on to, and along a drying table. When it reaches the end of the drying table it is in a fit condition to be subjected to the ordinary breaking and scutching apparatus.

VEGETABLE FIBER.

Bertrand S. Summers, of Port Huron, Michigan. Patent No. 864,574, dated August 27, 1907.

This invention relates to the preparation of vegetable fibers both for paper making and for spinning-yarns and the like and consists in a new process or method for treating the vegetable fibers whereby a better and more uniform quality of stock results and less waste of material is caused and whereby also the time required for the several operations is considerably reduced as compared with present methods.

The process is based on the use of calcium chloride in the digester.

Referring first to the process for preparing paper stock for paper making, introduce into an ordinary paper-maker's rotary digester the vegetable straw which may be any one of the usual straws used for this purpose such as oat straw, wheat straw, flax straw, etc., and add thereto about one-seventh of its weight of calcium chloride, together with sufficient water to cover the straw which water in most cases would be about eighty parts by weight. The proportions mentioned are therefore approximately about seven parts of straw, to one part of calcium chloride and eighty parts of water. The straw is then digested for a period of about twelve hours under from forty to fifty pounds steam pressure whereupon the stock is ready to be introduced into the usual and well known beating engines and then prepared in the usual way as is practiced in paper mills.

Next referring to the process for preparing the straw for spinning purposes, the material is digested a shorter time than when intended as a paper stock, usually not more than two or three hours and with a more concentrated solution of the calcium chloride. Moreover, it is also desirable to employ a stationary vessel instead of a rotary vessel or digester so as to prevent the stock from being tangled which is objectionable in spinning-fibers but not objectionable in paper stock. In this process about a twenty per cent. solution of the calcium chloride is used with a pressure from forty to fifty pounds as in the case of the treatment for the production of the paper stock.

LEATHER PRESERVING AND FINISHING COMPOUND.

Thomas P. Garrett, of Westcliffe, Colorado. Patent No. 865,881, dated September 10, 1907.

This invention is an improved leather finishing and preserving compound and also serves to render leather water-proof, and to give it a gloss and render the leather soft and pliable so that it can not be readily broken.

This improved leather preserving and finishing compound consists of boiled linseed oil 64 parts by weight, vaseline 8 parts by weight, lamp black 1 part by weight, oil of cloves a sufficient quantity.

PROCESS FOR THE MANUFACTURE OF ARTIFICIAL SILK FILAMENTS FROM NITROCELLULOSE.

Charles Bottler, of Jülich, Germany, assignor to Kunstfäden Gesellschaft Mit Beschränkter Haftung. Patent No. 866,768, dated September 24, 1907.

It is now found that the zone of moisture content of the nitrocellulose which is technically of greatest advanage both in respect of the attainment of the quickest and clearest solution possible in

the known solvents, as well as in respect of the further working up of the colodion solution obtained in this way and of the final product thereby obtained into artificial silk, lies between 20 and 25 per cent.

It is found disadvantageous to carry out drying by presses, in a current of air or by heat, as is necessary where the water content is below 20 per cent. It is also found that by a single extraction in a centrifugal machine the water content of the nitrated cotton coming from the washing machines can only be reduced down to a water content of about 25 per cent., so in carrying out the improved method, while observing the rules laid down by practice, the once extracted nitrated cotton is introduced in small portions into a second and thence into a third and if necessary into a fourth centrifugal machine and in this way, by keeping time accurately to seconds, a regular abatement of the water content within the limits of a few per cent. is successfully obtained. The nitrated cotton prepared in this careful way and in contradistinction to previous experience and observation can in all cases be brought to an easy and clear solution which filters well. The solution takes place in closed vessels in the proportion of 18 to 23 kilos, dry weight, of nitrated cotton to 100 liters of solvent, consisting of a mixture of alcohol and ether in the proportions of 3: 2 or 1: 1; this is however only an example. Other relative proportions of weight and measurement, as well as mixtures of other known solvents such as methylalcohol, acetone, etc., may however be employed.

APPARATUS FOR SEPARATING SULPHURIC ACID.

Frederick Gardner Cottrell, of Berkeley, California, assignor of one-half to Harry East Miller. Patent No. 866,844, dated September 24, 1907.

The apparatus is for use in connection with the process of manufacturing sulphuric acid which is described in U. S. Patent No. 866,843, and which may be briefly stated to consist in the sepa-

ration and collection of the sulphuric acid previously disseminated in the form of fine liquid particles through indifferent gases. This mixture is formed by hydrating sulphur trioxide mixed with indifferent gases, whereby a fog or mist results, in which fine particles of sulphuric acid are held in suspension, which said particles under the influence of centrifugal action, are separated, collected and discharged.

In an apparatus for this purpose, it is essential to provide a suitable seal for the rotating shell which will prevent the escape of the gases, while still providing for the discharge of the collected sulphuric acid. Such a seal, together with the novel construction of the rotating shell, constitute this apparatus.

RESIN SOAP.

Ernst Fischer, of Dresden, Germany, assignor to the Arabol Manufacturing Co. Patent No. 867,963, dated October 15, 1907.

This invention describes improvements in the manufacture of resin size and particularly a hard and brittle size which under blows of a hammer breaks like crude resin and which contains free resin.

For this purpose the invention consists essentially in mixing the required quantities of resin and soda (sodium carbonate) with the minimum amount of water; boiling this mixture within a suitable vessel and keeping substantially constant the said amount of water by condensing the vapors of the same within said vessel and directly returning it; permitting the carbonic acid evolved to simultaneously escape; and finally after the complete escape of the carbonic acid removing the water.

PULVERULENT COLORING MATTER FOR LEATHER.

Christoph Reinhold, of Hanover, Germany. Patent No. 868,008, dated October 15, 1907.

The method of manufacture of the improved coloring matter consists in adding talc to coloring matter mixed with oily or

fatty substances, until the mixture is a pulverulent mass. For example, an intimate mixture is prepared, having the following constituents by weight:—5 parts olive oil, 2½ parts cocoa-nut oil, 1 part Castile soap, 1 part tallow, 1 part lard, 1 part wax, 1 part sugar, 1 part coloring matter of any suitable kind. To this mixture talc is added until the talc has entirely absorbed the mixture, the resultant produce being a stable powder. The stability of the powder is due to the fact that the talc particles saturated with fatty matter are comparatively heavy, so that they are not dispersed or carried away by air currents.

The coloring matter is applied by rubbing it on to the leather. The fastness of the color and the polish of the colored leather are proportional to the amount of friction applied with a woolen cloth when the coloring matter is spread on the leather.

Any color can be used in the mixture. A uniform coating of color is produced by rubbing the mixture on the leather. There is an absence of the blotchy or mottled appearance which arises from the use of coloring matters which do not uniformly penetrate into the leather.

PROCESS OF PREPARING FROM CELLULOSE, PAPER-PULP, WOOD-PULP, OR SIMILAR MATERIAL, STRIPS CAPABLE OF BEING SPUN.

Alfred Leinveber, of Hilbersdorf, Germany. Patent No. 868,193, dated October 15, 1907.

The known methods, hitherto used for the process of preparing from cellulose, paper-pulp, wood-pulp and similar material threads or strips capable of being spun, do not allow, when paper machines are used of the formation of strips, of the full width of the machine's capacity nor of the full speed of the machine being utilized, and when a paper strip is used in the initial step for the formation of the thread, the band like form is not avoided and a perfectly round thread is not obtained. These drawbacks

are overcome by the present invention the short fibers such as those of cellulose, etc., floated up in liquids being united upon a paper machine to the full width of the latter so as to form the paper band: this paper band is then by dividing devices cut into strips which are moistened and condensed without being twisted.

PAINT OR COATING COMPOSITION.

Joseph C. Jepson, of San Francisco, California, assignor of one-half to Edward K. Taylor. Patent No. 868,442, dated October 15, 1907.

This invention relates to a material which is designed for coating steel, iron, tin, brick and other surfaces, and for the protection of such surfaces from the effects of the elements.

It consists in the combination of substances and in the separation of the active portion of such compounds from the inert material, said active portion being retained in a liquid form and in condition for use.

In the preparation of my compound take Portland cement of good quality and mix it with a serous fluid, such as whey or similar substance, agitating the same thoroughly, and allow the inert portion to settle to the bottom. The other part is then drawn off and may be preserved in containing receptacles ready for use.

PROCESS OF PREPARING CASEINE SOLUBLE TO A NEUTRAL SOLUTION.

John A. Just, of Syracuse, New York. Patent No. 868,445, dated October 15, 1907.

The invention relates to a process for preparing milk caseine for commercial purposes readily soluble to a neutral solution.

Separated milk is preferably diluted with two to four times its volume of water and most intimately mixed therewith. The mixture is gently heated to about 90 to 100° F., and acetic acid is slowly added in about the ratio of 1/10 per cent. sufficient to precipitate

caseine slowly. The acid is intimately mixed with the diluted milk and the heat raised gently until the complete separation of caseine has taken place. The temperature should not exceed 140° F. The mass is allowed to rest and after a short time a dense sheet of caseine is formed on the bottom of the vat.

The sheet of caseine thus formed may be washed and well drained to free it from adhering whey, etc., and then is removed and broken up into small pieces by hand or by passing through a suitable mill, and mixed with a suitable quantity of alkali or alkaline salt to form a neutral porous paste or solution and dried to form a neutral caseine. The drying may be accomplished in any suitable way. The curd may be dried in its simple state, and the requisite alkali then added to it in the dry powdered state, or an alkaline salt, as for instance, sodium carbonate, sodium borate, sodium phosphate, or an alkaline earth may be used dry and added to the caseine in sufficient quantity to form a neutral solution when dissolved. The quantity of alkali necessary for this is ascertained by a trial test and a large quantity then treated accordingly. The required amount of alkali and caseine may then be ground together or intimately mixed. Upon the addition of water the caseine will be dissolved to a pasty mass ready to be used for any suitable purpose. It may be compounded with coloring matter and mineral substances in powdered form, thus forming the binding agent of cold water paint, or used in any of the many ways commercial caseine is applied in the arts.

PAINT REMOVER AND PROCESS OF MAKING THE SAME.

Francis X. Govers, of Owego, New York. Patent No. 868,920, dated October 22, 1907.

Following is a practical example of this remover and of the process of making the same. Mix about 1600 parts of ordinary commercial cresylic acid or cresol with 1500 to 1600 parts of commercial benzol and the same quantity of commercial wood

alcohol. The mixture forms a clear solution. Upon now adding about 500 parts of commercial dried caseine, preferably ground to about 120 mesh, it will be found not to dissolve to any extent, at least at first. But upon adding a small quantity of a concentrated acetic acid, say about 5 per cent., or in this case, about 250 parts, the caseine will be found to go into solution, producing a thick transparent or translucent mass of a consistency somewhat greater than that of castor oil. The stated amount of caseine is about 10 per cent. of the whole mass. The solution is facilitated by warming or by violent stirring; the latter, because of the thick consistency, being best performed by some commercial form of stirring apparatus. If the remover is desired somewhat thicker a little more caseine may be employed; if somewhat thinner, a little less. But for most purposes, 10 per cent. will give about the right consistency.

PAINT.

Elmo H. Wykoff and George R. Rishel, of Alexandria, Pennsylvania. Patent No. 869,123, dated October 22, 1907.

This invention provides a paint especially adapted for submarine work and iron and wooden piers, docks, ships and boat bottoms in salt or fresh water. The paint when applied prevents erosive action of the material to which applied whether located in salt or fresh water.

In preparing the paint, the following ingredients are combined by weight in the proportions substantially as specified, viz.: Linseed oil, four parts. Rubber (any waste black, not white) two parts. Sulphur, one part. Alum (powdered) one-half part.

In combining the materials, the linseed oil is heated to the boiling point after which the rubber is gradually added thereto, the whole being constantly stirred until the rubber is melted, after which the sulphur is gradually added and stired into the mass of oil and rubber. Next the alum is gradually added and stirred in, care being observed to prevent boiling over of the

mixture. Prior to adding the alum, it is preferable that the mixture of linseed oil, rubber and sulphur be allowed to cool. After the alum has been stirred into the mixture, the whole is boiled until it assumes the consistency of syrup, after which it is set aside to cool and placed in packages which are sealed.

PAINT-REMOVER AND PROCESS OF MAKING THE SAME.

Francis X. Govers, of Owego, New York. Patent No. 869,176, dated October 22, 1907.

This product is similar to that described in U. S. Patent No. 868,920 the present one using toluol in place of the benzol in the former.

PAINT AND VARNISH REMOVER.

Walter S. Hanna and Joseph D. Bryant, of Columbus, Ohio. Patent No. 870,508, dated November 5, 1907.

The object of this invention is to provide an improved paint and varnish remover of economical and effective form.

The remover, according to this invention is made by mixing the following materials in the following quantites by weight: fat in the form of lard or tallow, five parts, nitric acid, two parts; rosin oil, twelve and one-half parts; benzol, three hundred and fifty parts; alcohol, three hundred and fifty parts; oil of citronella, two and one-half parts. Mix these materials, in the proportions stated, in the following manner. The benzol and lard or tallow are mixed together and heated in a kettle to the boiling point and for the purpose of dissolving the lard or tallow. Then remove the kettle from the fire and add to the mixture therein the alcohol, and after this the acid, and finally the rosin oil and oil of citronella. The dissolving of the fat is promoted by stirring, and the contents of the kettle are also stirred when adding the other ingredients.

COMPOSITION FOR REMOVING PAINT OR VARNISH.

Samuel P. Sadtler, of Philadelphia, Pennsylvania, assignor to Edwin Johnson. Patent No. 871,525, dated November 19, 1907.

The preparation consists primarily of acetone oil which is the essential and active ingredient. By acetone oil is meant the mixture of ketones which is obtained as a by-product along with acetone in the preparation of the latter and which is separated in the purification of the acetone.

While acetone oil is a powerful solvent, it has been found to operate more quickly and thoroughly when combined with one or more other chemicals which are, preferably, also solvents. Benzol, toluol and either wood or grain alcohol may be advantageously combined with the acetone oil, and when the same are used a desirable formula for the compositon is—acetone oil, two parts; benzol, one part; toluol, one part; and a mixing agent—such as alcohol, one part, the whole being thoroughly mixed by agitation.

STRIPPING PAINT AND VARNISH REMOVER AND PROCESS OF MAKING SAME.

Peter T. Austen and Frederick J. Maywald, of New York, and Francis X. Govers. Patent No. 871,750, dated November 19, 1907.

The novelty of this patent appears in this section of the description.

The inventors refer to former colloided acid paint removers, and claim particularly by increasing the relative amount of colloide and of acid to that of the volatile solvent in the mixture, removers of a new type may be produced, having not only the power of softening, disintegrating and loosening paint and varnish but the additional power of combining with such softened and loosened paint or varnish to form tough, coherent masses or skins which may be readily lifted and stripped or peeled as such from the coated surface.

The claims in this patent number thirty-three.

PAINT AND VARNISHING REMOVER.

John F. Dickson, of Binghamton, New York. Patent No. 871,790, dated November 26, 1907.

The specific claim is for:

A paint and varnish remover consisting of one part of pulverized alum and three parts of a mixture consisting of eight parts of acetone, two parts of benzol and two parts of toluol.

PAINT COMPOUND.

Charles J. McLennan, of Detroit, Michigan. Patent No. 872,960, dated December 3, 1907.

This invention relates to paint; it has for its object an improved combination of substances to be used as a paint for the preservation or ornamental coating of articles of wood, or other material with which such coatings are commonly and usually used.

The combination of materials is as follows:—one-half pint of bichromate of soda; three pints solution of silicate of soda; twelve pints of water; one pint of linseed oil; one-half pound of glue, and approximately five pounds of pigment.

The amount of the pigment varies somewhat, dependent upon the specific gravity thereof, as the liquid constituents will suffice for a larger weight for an article of greater specific gravity, and will suffice for a less amount in weight for an article of less specific gravity.

SUBSTANCE FOR TREATING HIDES AND PROCESS OF MAKING SAME.

Ottokar Henry Nowak, of Chicago, Illinois, assignor to Nowak Manufacturing Company. Patent No. 873,074, dated December 10, 1907.

This invention relates to a substance for use in preparing and tanning hides and skins, and to a process of producing such substance from milk.

The process consists in precipitating the curd in milk, removing the precipitated curd, changing the condition of the sour liquor remaining after the removal of the curd by permitting fermentation thereof for a period of at least seven days, so that it contains at least 1 per cent. acidity calculated as lactic acid, concentrating the fermented sour liquor, and finally adding some unconcentrated fermented sour liquor.

The result is a bacterial substance derived from milk composed of concentrated and unconcentrated fermented sour liquor.

LIQUID LEATHER-DRESSING.

George W. Childs, of New York, N. Y. Patent No. 875,653, dated December 31, 1907.

This is a preparation adapted for dressing leather to increase its solidity when dried.

The method of production is as follows:

If the spent liquor contains lime or lime compounds, these components may be precipitated by the addition of chemicals forming insoluble compounds with lime. For instance, ammonium oxalate, sodium phosphate, sodium fluoride or carbon dioxide gas may be employed to effect such precipitation. The precipitate is then settled out and the supernatant liquor run off for further purification or concentration. If the spent liquor contains non-volatile impurities, such as mineral acids, these may be either naturalized by the addition of alkali, such as sodium hydrate or potassium hydrate or may be precipitated by the addition of bases forming insoluble compounds with the acids, such as barium chloride. Said spent liquor may then be heated until the volatile impurities, for instance, acetic or propionic or butyric acids, are eliminated and the resultant liquid is concentrated, conveniently by continued heating *in vacuo*, until it attains a specific gravity of 1.05 to 1.3.

PART IV

Notes on Processes New Colors, etc.

Notes on Processes, New Colors, etc.

AN IMPROVED METHOD OF WEIGHTING SILK.

The author states that the object of weighting silk is to make the fibre thicker and fuller so that after weaving, the goods have a better appearance and a good feel. Unfortunately it is not as yet possible to weight silk heavily without detracting from some of its most valuable characteristics, elasticity and strength. Many remedies have been proposed, such as the use of sulpho-cyanides and hydroquinone preparations.

It is claimed that preparations of malt, for example Diastafor, protect the silk fibre to a considerable extent from the injurious effects of the weighted material.

This result is easily understood on comparing the causes of the tendering with the properties of Diastafor. The silk fibre is compound with many very fine filaments glued together by the sericine. In degumming and weighting, these filaments are separated in water and the strength due to the combination is lost. Diastafor serves as a binder and restores the strength of the fibre.

Another cause of the weakening during weighting is due to the fact that the agents employed are crystalline in water. By crystallization in the fibre they force the separate threads to make room for the crystals. In the presence of Diastafor the crystals are without injurious action as the separate filaments are not broken. At the same time, Diastafor itself makes the fibre thicker and fuller and is thus able to take the place of part of the weighting, especially as it also improves the handle of the silk.

The method of using Diastafor is to add from ten to twenty per cent. of it to the usual oil emulsion and acid bath employed for brightening. If, however, an extra scroop is required, the material is finished and dried and then worked in an old brightening bath, to which forty to sixty per cent. of Diastafor has been added with a little citric acid. The goods are worked in it for about one hour. In this way black silk weft, which, in spite of heavy weighting gave a deficient scroop, was restored to an excellent handle and a much better appearance.

Diastafor can be recommended in the following cases:

1. With Canton Silk or any other kind which is hairy by nature or becomes so following the weighting. The lustre is restored to a great extent.

2. With all silk which has been extremely heavily weighted, in order to increase the strength.

3. With silk in general and especially heavily weighted tram to give a full and leathery handle.—*Faerber Zeitung.*

SILK DYEING.

According to a Crefeld patent tussah and other silks can be dyed black with a mixture of dinitroresorcine in 50 per cent. paste glycerine and Diamond Black. The mixture contains 40 per cent., 20 per cent., and 40 per cent. of these ingredients respectively. The silk is first mordanted for half an hour in iron liquor of 13° Bé, rinsed, and then worked for from one and a half to two hours in a bath containing 20 pounds of the above mixture for every 100 pounds of silk, and also a pint of acetic acid for every 40 gallons of bath. The dyeing temperature must not exceed 30° C., for the first half hour, but is then gradually raised to 80°, and kept there to the end. The dyeing must be containued until the bath is exhausted, two hours being usually ample. The color is then fixed by a warm bath of 1 per cent. of bichromate lasting half an hour. The goods are then lifted, rinsed, oiled and brightened with lemon-juice.

JANUS BLACK D.

This is a new member of this class of colors which is intended for silk and artificial silk. It gives a deeper shade than the other Janus blacks but the method of dyeing is the same.

It is recommended for dyeing tin weighted or pure dye silks and for all kinds of artificial silk.

THE APPLICATION OF THIOGENE COLORS TO SILK AND HALF-SILK DYEING.

By this method silk and half silk piece-goods may be dyed in single passage through a suitable machine. The cut shows a machine which is properly constructed for the purpose, but any one in which the same principles are carried out can be used.

As it is necessary to maintain a temperature of 175° to 185° F., the bath must be heated and for this a steam coil should be used, if possible, to avoid the increase in volume of the dyebath. A suitable arrangement must be made for supplying the feed-liquor, as the strength and quantity of the dyebath must remain constant while the goods are running. A convenient form is shown in the cut. The dye-box may be made of wood or iron and the squeeze rolls preferably of lead-coated iron.

Preparation of the dyebath: The concentration of the dyebath depends on the weight and style of the material to be dyed, the desired depth of shade and the speed of the machine. An average composition is as follows:

For 240 gallons of dye liquor

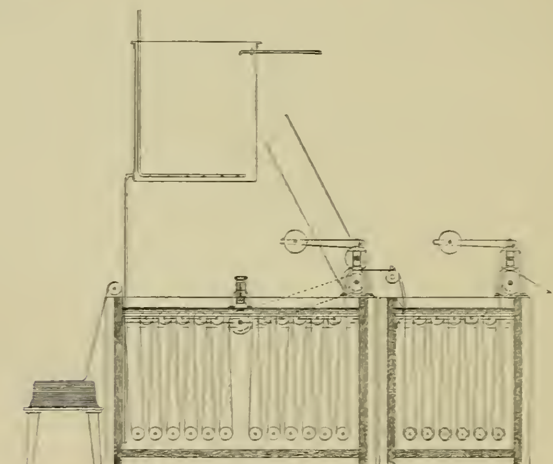
120 lbs. Thiogene Black M Liquid

120 lbs Sodium Sulphide

150 lbs. Sodium Bisulphite powdered.

The dye-box is filled about three-fourth full of water, then the sodium sulphide dissolved in 40 gallons of hot water is added, next the liquid Thiogene Color and the bath is well stirred. Then the bisulphite is slowly sprinkled in while the

bath is kept in motion. When this is properly done the dyebath is practically odorless and shows a weak alkaline reaction. The proper condition may be tested by putting a drop on filter paper and immediately alongside a drop of phenolphthaleine solution (½ to 1000, 60 per cent. alcohol). The contact should show at once or at the latest after one or two seconds a weak violet color. If a longer time is required, some sodium sulphide should be added, if it colors very strongly, more bisulphite is required. When the desired reaction is shown, the bath is filled up, heated to 175° to 185°, and this temperaure maintained during the operation.



DYE-BATH. RINSE-BOX.

The feeding liquor is made up in the same proportion but with a small quantity of cold water in the tank. This half filled with water, the sodium sulphide and dyestuff added, after ½ hour when the solution is perfect, the bisulphite is added while stirring during another ½ hour. All foaming must be avoided. This

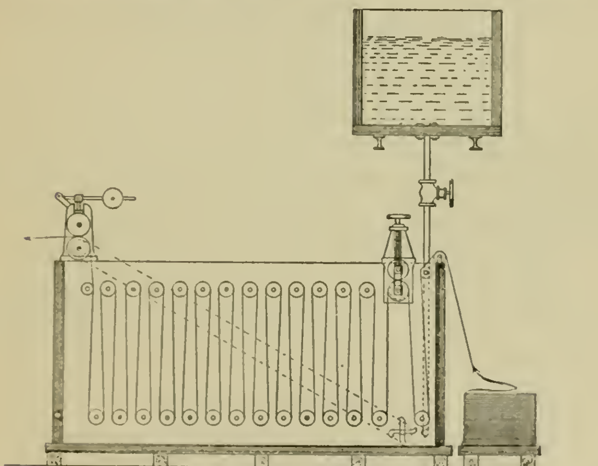
feeding liquor has 2–3 times the concentration of the dyebath and is kept cold.

After a passage through the machine, which should require 3 to 5 minutes, the goods are squeezed, well rinsed in the box attached for the purpose and then thoroughly washed in a suitable machine. The size of the dyeing machine should be regulated to suit the material to be dyed.

Thiogene Black M Liquid, Thiogene Black B 2R Liquid and Thiogene Black B B Liquid are recommended for this purpose.

COTTON DYEING IN COTTON AND WOOL UNION GOODS WITH THIOGENE COLORS.

The cotton contained in union piece goods can be covered (previous to dyeing the wool in an acid bath) by passing the



pieces for a few minutes through a cold bath of Thiogene Colors. A box with rolls, suitably arranged according to the sketch, is the most advantageous machine for carrying out this process.

This box has two sets of squeeze rolls, one close to the front of the box is under the liquid and worked by screw-pressure; the other, at the opposite end where the pieces leave the machine, is placed above the surface of the liquid and worked by levers and weights.

Above the box is a supply tank, which contains the feeding liquor; the latter is run into the box through a pipe which reaches along the bottom. The horizontal part of this pipe is perforated and a mechanical agitator, mixes the fresh liquor evenly in the dyebath.

The concentration of the first dyebath varies according to the amount of cotton in the pieces, the depth of covering which is required, the number of passages and the speed of the machine.

First bath of 220 gallons capacity.

64 lbs. Thiogene Black B 2R liquid
32 lbs. Sodium Sulphide cryst
35 lbs. Bisulphite cryst
40 lbs. Glauber's Salt.

The Sodium Sulphide is dissolved in hot water, then the Thiogene Black Liquid added and the solution poured into the box. Then the solutions of Bisulphite and Glauber's Salt are added and the whole well stirred after each addition

Thiogene Black B 2R liquid yields violet blacks,
Thiogene Black M liquid yields rather greenish blacks.

The concentration of the feeding liquor varies according to the cotton contained in the goods, degree of moisture of the pieces and to the pressure applied in squeezing.

This liquid is generally prepared 1½–3 times stronger than the dyebath but no Glauber's Salt is used.

220 gallons feed liquor are made up with:

92–192 lbs. Thiogene Black B 2R liquid
48– 96 lbs. Sodium Sulphide cryst
52–104 lbs. Bisulphite cryst.

For dry pieces, which absorb an equal weight of liquor, the

lesser concentration is sufficient, but wet goods require a higher concentration of the feeding liquid.

A box of 190–220 gallons will dye about 6000 yards per day.

After passing the pieces through the cold bath once or several times (each passage to last two minutes) until the cotton is thoroughly dyed, they are either wound on a roll and washed when convenient or they are rinsed at once in a washing machine.

The wool is then dyed in the usual way with acid colors.

THIOGENE BLACK 4 B LIQUID.
THIOGENE BLACK B V LIQUID.

These liquid blacks have been introduced to meet a demand for bluer shades of black than those from the older M Liquid. These liquid blacks have the great advantage that a very small quantity of sodium is required to maintain the proper condition of the dyebath as none is required to dissolve the color, an equal weight of sodium sulphide and dyestuff being all that is necessary.

The usual additions of soda and salt are used in the dyebath. The material is dyed for one hour at 200°, squeezed, washed and finished as usual.

The operations are managed exactly the same as with the corresponding marks in powder form.

THIOGENE BRONZE G.

This is a new member of the Thiogene group and is dyed as usual in a bath containing salt and soda at 200° F. The dyestuff requires an equal quantity of sodium sulphide crystals for proper solution.

As with most of the other colors of this class, the shades are sufficiently fast to meet all demand except that they will not

stand chlorine bleach. It is recommended for dyeing all varieties of cotton material.

THIOGENE GREEN G.

This is a new sulphur color which is characterized by its relatively great tinctorial power. It requires twice its weight of sodium sulphide crystals for solution and is dyed with the usual addition of soda and salt to the dyebath. The dyeings must be suitably oxidized to properly develop the shade.

The resulting shades have the usual fastness to all influences except chlorine bleach. It can be used alone or in combination with other Thiogene colors for all kinds of cotton dyeing.

ROSAZEINE 6 G, 6 G EXTRA.
ROSAZEINE 6 G D, 6 G D EXTRA.

These are basic colors which are yellower in shade than Rosazeine 4 G. They are suitable for use in calico printing and dyeing, meeting the requirements for this purpose in regard to fastness to washing, soaping, light and chlorine.

As they resist the action of reducing agents, they can be used for colored discharges with either tin crystals or Hydrosulphite N F or N F conc. As they are not affected by sulphites they can be also used for aniline black and nitroso blue discharges.

In dyeing they can be used to replace similar products of the class and are used in the same way. Silk is dyed in a neutral or slightly acid soap or boiled off liquor bath. Half silk must be mordanted with tannic acid and antimony.

For silk printing no mordant is required but the usual addition of tannic acid improves the fastness. but for wool and cotton and silk and cotton unions, its use is necessary.

AUROFLAVINE KR.

This is a basic yellow suitable for printing which approximates on shade the yellow obtained with the Persian Perries on tin mordant.

The tannin lake resists the action of reducing agents but is destroyed by oxidation and the color is especially recommended for colored resist for Prud'homme Aniline Black. The fastness to light, washing and chlorine is good.

AZO PINK NA.

This is a brilliant shade of pink which is recommended for use in combination with other colors on naphthol grounds. On account of its fastness and brightness of shade it should prove of interest.

NAPHTHOL PREPARATION.

15	parts	Beta Naphthol
30	parts	Caustic Soda solution 32° Bé.
15	parts	Para Soap
1000	parts.	

DIAZO SOLUTION.

67.5	parts	Azo Pink N A.
		are ground to a smooth paste in
125	parts	Water
		To this is added the mixture of
325	parts	Water
71.5	parts	Sulphuric Acid 66° Bé.
250	parts	Ice
		The diazotization is carried out by adding
30	parts	Sodium Nitrite
		dissolved in
125	parts	Water

It is allowed to stand until the diazo solution becomes clear and the printing pastes are made up as follows:

RED PRINTING PASTE.

270	parts	Diazo Solution
500	parts	Tragacanth 6–100
205	parts	Water
25	parts	Sodium Acetate

PINK PRINTING PASTE.

70 parts Diazo Solution
500 parts Tragacanth 6–100
345 parts Water
75 parts Acetic Acid 50 per cent.
10 parts Sodium Acetate.

A NEW DEVELOPER.

Omega methyl sulphonic acid is proposed as a new developer for the insoluble azo colors in the patent of the Calico Printer's Association and E. A. Fourneaux (29,134, 1906). For instance, if the cloth is prepared with a beta-naphthol solution and padded with a solution resulting from the action of formaldehyde-bisulphite on alpha-naphtylamine and then printed, padded or dyed of diazotized paranitraniline, a red will result where the diazo compound comes in contact with naphthol only and purple where it comes in contact with the omega compound. The following are two examples:

1. On cloth prepared with alkaline beta-naphthol solution (25: 1,000) print the following color: 100 parts British gum solution, add 13.6 parts alpha-naphthylamine omega compound, 55 per cent. paste, and dissolve by heating in a steam jacketed pan and then cool. After printing, dry and cover with diazo-paranitraniline printing color, made up in the usual manner. Wash in cold water for about five minutes and soap at ordinary strength for about fifteen minutes at a temperature of about 60° C.

2. On cloth prepared with alkaline beta-naphthol as above. Take 90 parts by measure of British gum solution, add 13.6 parts by weight of the alpha-naphthylamine omega compound, 55 per cent. paste, and dissolve by heating in a steam jacketed pan, and then cool. When quite cold add a cold solution of 2 parts by weight of ammonium chloride in 10 parts by measure of British gum solution. After printing, dry and cover with

diazo benzidine printing color, made up in the usual manner. Steam for about five minutes in a continuous ager. Wash in cold water for about five minutes, and soap at ordinary strength for about fifteen minutes at a temperature of about 60° C.

Further new effects can be obtained by printing white or colored resists simultaneously with, or before or after, the omega compound, or by printing with beta-naphthol solution instead of preparing with it as in the above examples. The resulting compounds can be fixed on the fibre by the usual means, for example, by treating with acids or alkalies. As a modification, the saponifying agent may be added to the color containing the omega compound, as in example 2, in which ammonium chloride is used for this purpose.

In some cases the saponified compound can be diazotized again on the textile fibres and coupled with amino or phenolic compounds, this yielding further new effects. Thus the purple shade obtained in the foregoing example turns to brown by saponification; to a different and deeper shade of brown by diazotizing and coupling with beta naphthol. It is believed that the resulting colors are due in the main to azo compounds formed by the action of the diazo compound on the omega compound. The novelty of the invention consists in the discovery of the fact that diazo compounds brought in contact simultaneously with beta-naphthol and with omega compounds have a selective affinity for and combine mainly or entirely with the latter. The process extends to all ice colors and all omega compounds.—*Dyer and Calico Printer.*

INDIGO AND ALIZARINE DYEINGS FAST TO BLEACHING.

Indigo, whether natural or artificial, when well dyed, is fairly fast to chlorine, and yet will not resist piece-bleaching. The only exception to this rule is Indigo MLB/T and this, although it stands piece-bleaching very well, always bleeds during the process on to white yarns or those dyed with other dyes, with which it

may be in contact in the fabric. Hence, after bleaching, the pattern is smudgy, and goods are unsaleable in the majority of cases. The indigos, including natural indigo, which are not fast to piece-bleaching, bleed in the early stages of the bleaching process, but all signs of this is, of course, removed by the time the bleaching is complete.

To dye indigo fast to bleaching the yarn is scoured with carbonate of soda and water glass, rinsed, centrifuged, and oiled three ends. It is then dried and soaked for five hours in a loose state in luke-warm water, and again centrifuged and dried. The yarn is then dyed in the vat to about half the depth of shade it has to show finally. It is then as usual scoured, rinsed and dried. After this it is again dyed, this time to pattern, scoured, rinsed, dressed and dried. The dried yarn is steamed for one hour, and is ready for weaving.

The following is the recipe for the oil above allued to. Stir gradually in the course of a quarter of an hour 10 pounds of sulphuric acid into 70 pounds of castor oil, and leave for eighteen hours, stirring at intervals during that time. Then add four pounds of ammonia and keep for use. Just before this oil is applied to the yarn, it must be made clear with more ammonia, and will probably require about another 6 pounds of the above quantities. This second lot of ammonia must not be added more than forty-eight hours before the oil is used, and if it can be added within one hour before use, so much the better.

The oiling process is carried out in the following manner: For the first end use the bath at about 50° C., and dry completely at from 70° to 75° C. Complete drying before the second end is essential. After the second end, dry at about 60° C. Then give the third end.

The same oiling serves for bleaching fast yarns of red and claret alizarine dyeings, except that a fourth end must be given.

To get dyeings with Indigo MLB/T, which are fast to chlorine and bleaching, proceed as follows: Scour the yarn for three hours with 2 per cent. of soda ash and 1½ per cent. of Turkey Red oil.

rinse chlore for half an hour with clear solution of chloride of lime of ¼° B., then rinse again, and scour for half an hour in sulphuric acid of ½° B. Then rinse very thoroughly, dry and dye in the hydrosulphite vat.—*Dyer and Calico Printer.*

SHRINKAGE OF WOOL.

Two methods of preventing the shrinkage of wools and half-wools are in vogue. One is to steam the goods, the other to give a bath of alum or sulphate of alumina. Neither method, however, is very satisfactory, and Floquet & Bonnet have found that better results are obtained by combining the two processes. They give first a bath of alum, from which the goods pass through carbonate of soda which precipitates hydrate of alumina on the fibre. The alumina is then fixed by steaming, and shrinking becomes impossible. The treatment is said also to avoid the unpleasant greasy handle imparted by the action of alum alone. Instead of fixing the alumina by steam, the necessary heat may be applied by hot cylinders or plates, or by passing the goods through boiling water.

NEW OR IMPROVED MANUFACTURE OF HYGIENIC TEXTILE FABRICS.

The invention consists essentially in producing upon, and chemically combining with the wool, a compound of tannin and formaldehyde, known as methylene ditannin. The compound is not taken up by cotton. Consequently as the methylene ditannin compound of the wool gradually splits off tannin and formaldehyde under the influence of perspiration, a frabric prepared with it exerts a disinfecting and astringent action on the epidermis, while at the same time the unaltered cotton absorbs any excess of perspiration. It is further asserted that materials prepared according to this new process keep the parts of the body which they cover permanently warm, and chills and chafing are avoided. As a practical instance the inventors state that the wearing of socks of such

material increases the marching power of soldiers very considerably. The treated materials may be washed with soap and water without loss of efficiency, as the wool-tannin-formaldehyde compound is not decomposed.

The following example is given:

The mixed fibres, either in the raw state or in the form of yarn or woven material, are boiled for about half an hour with a concentrated tannin solution, and then thoroughly washed in cold water. The fibre is then steeped in a cold bath containing 15 parts 40 per cent. formaldehyde solution, 15 parts hydrochloric acid, and 100 parts water for 1 to 1½ hours and, after washing and pressing, dried in the air.

For detecting methylene ditannin in wool, the finely cut fibres are steeped in concentrated sulphuric acid and gently warmed, whereupon the fibres and solution become gradually brown and subsequently green in color. The green solution, on addition of a small quantity of alcohol, becomes blue and finally wine-red. Furthermore, the methylene ditannin can be dissolved out of the wool with decinormal caustic soda and reprecipitated with decinormal hydrochloric acid.

AMIDO BLACKS 10B, 3B AND T.

These are acid blacks which are dyed with Glauber's salt and acid. In some cases oil of vitrol is used but with goods which do not penetrate easily, it is best to start with a weak acid such as acetic or formic and exhaust the bath if necessary with a stronger. With interwoven white cotton threads a stronger acid is necessary and under these conditions the 3 B mark leaves the cotton perfectly white, the other only tinting it slightly.

The fastness to alkali, perspiration, and acids, is satisfactory, the fastness to light is better than that of logwoods, and shades stand carbonizing and storing.

As they dye wool to a great extent in a neutral bath, they may be used as a wool dye for unions.

They are recommended as cheap level dyeing blacks of satisfactory fastness for ladie's cloth piece dyes, etc.

FAST ACID BLACK R, T & 3B.

These are acid wool colors dyed with a weak acid such as formic, and the shades are claimed to practically equal developing colors in fastness. The colors are easily dyed and are suitable for piece goods, yarns, slubbing and loose wool which are only to be lightly fulled and for felt hats.

The R and T brand are among the fastest to light and acid wool colors. The fastness to washing is remarkable for acid blacks. The R and T brand stand even alkalies but lose color in boiling soap solution. Cotton effect threads are not stained, but silk is strongly colored.

Flavazine S and T, Orange II and G, Azo Acid Red B and 5B, Amido Naphthol Red G, 2B and 6B, Acid Magenta G, Fast Acid Violet A 2R, Acid Violet 6 B L, 6 B N, Indigo Substitute V extra, Patent Blue A and V, Naphthalene Green V and conc., and Acid Green are suitable for combination with these blacks.

These Fast Acid Blacks can also be dyed on an indigo bottom for dark blue and black blue shades.

MONOCHROME COLORS.

This is a new group of colors which are dyed by a new process which seems to offer many advantages.

As the name indicates, these require the presence of chromium in the dyebath to properly develop the color, but it is used in the rather unusual form of ammonium chromate. As the use of a weak acid is also necessary, the matter of supplying the proper chromium salt is comparatively simple as the ammonium salt can be supplied by the use of a sodium or potassium bichromate in conjunction with ammonium acetate. In practice the method followed is to prepare the dyebath with the necessary dyestuff, then add 5 to 7 per cent. ammonium acetate and an amount of bichromate equal to half the weight of the dyestuff.

These colors can be handled in the same way as acid colors. The fibre absorbs the dyestuff slowly and the shades develope continuously so that the dyeings are perfectly level and the dyer has no difficulty in matching shades as an extended after-treatment is not necessary, and the final result is obtained when the dyeings have had the proper time in the dyebath.

The shades obtained by the use of these colors are fast to light, stand fulling and the other processes of finishing perfectly and will not bleed into interwoven white effects.

They can be recommended for all sorts of fast color dyeing where the shade is not too heavy. They appear to fill a long felt want in the production of modes, tans, drabs, etc., for perfectly fast and level shades on yarn, raw stock and piece goods.

The line at present comprises:

Monochrome G
Monochrome Grays G and B
Monochrome Blue G
Monochrome Yellow G and R
Monochrome Orange R
Monochrome Green A G
Monochrome Brown A B

and if necessary, Fast Fulling colors may be used for shading, such as:

Fast Acid Violet R
Fulling Violet N O
Fulling Red B, etc.

STEAMING PIECES.

Steaming dyed or printed goods is usually done when the goods are motionless in a room filled with steam. Dr. V. Fussganger, of Hoechst on the Main (German patent 184,324) proposes that the piece should travel through a current of steam going in the same or in the opposite direction. One great advantage is that the steam current rapidly drives all air out of the steaming chamber. In the ordinary process the air is expelled very

slowly, and probably never completely. In many cases, *e.g.*, with hydrosulphite discharges, etc., it is most important to have no oxidizing agent, such as air, present.

MAGNESIUM CHLORIDE IN FINISHING.

The use of magnesium chloride in textile finishing is still very common and often recommended, although it often causes much trouble, and should, in the opinion of the writer, be banished from the textile industries altogether. In small quantities it does not produce the effects expected from it. In large quantities, it has other effects, and most injurious ones too. It is difficult to understand why some finishers have such an affection for magnesium chloride, for uninjurious substances equal or superior to the chloride in every useful direction are upon the market. One of the chief reasons for using magnesium chloride in dressings and fillings is its hygroscopic nature. In virtue of this, it prevents goods impregnated with it from becoming quite dry, so that they always have a smooth, soft handle. The salt is, however, too hygroscopic, and in wet weather may absorb so much moisture from the air that the goods containing it feel positively damp, and are quite unsaleable. Sulphate of magnesia is to be preferred to the chloride, as being hygroscopic enough, but not extremely so, while its price differs but little from that of the haloid salt. Another objection to magnesium chloride is its chemical instability. It readily gives off hydrochloric acid, especially under the influence of heat, and this acid particularly when in the nascent state, is very destructive to vegetable fibres. This tending makes itself felt under heavy loads of magnesium chloride, even when the goods are dried at comparatively low temperatures, and is very marked when drying machines with heated cylinders have been employd. As substitutes it will be found that Epsom salts mixed with a small proportion of Glauber's salt or a potato syrup will give results equal in all desirable respects to those obtained with magnesium chloride, and at no great cost.—*Dyer and Calico Printer.*

LEATHER BLEACHING.

Three methods are employed for leather bleaching, oxidation, reduction and acid bleaching. There is a topping process to be presently described in addition to the real bleaching processes, a method that is of hiding a color instead of bleaching or stripping. It goes without saying that in many cases, the actual process adapted is a combination of two or more of these typical methods. The oxidation bleach is the favorite with chamois and skins from furred animals. Recution bleaching is used for the same articles to a less extent. Ordinary leather is generally acid bleached.

OXIDATION BLEACH.

The oldest of these methods is grass bleaching, but the great time which it requires has caused bleaching with peroxide of hydrogen or sodium, which from this point of view may be regarded as concentrated sunlight, to replace it in a very large measure. Leather tanned with vegetable tannins should not be bleached in this way. It bleaches easily under the treatment certainly, but is very apt to darken again afterwards. In using sodium peroxide, the white commercial powder is stirred into a half per cent. solution of oil of vitriol until the liquid is just preceptibly alkaline. The leather is then soaked in the liquid until the bleaching has reached the desired point. It must be stirred about occasionally. Another oxidizing bleach for leather is permanganate of potash, but it is most important to use this in acid solution, as alkaline permanganate liquids tender the leather. This is a very favorite method in France for bleaching chamois leather. The solution used is one of 2 pounds of permanganate in 200 gallons of water, and it is just acidified with sulphuric acid. A sulphurous acid bath (sodium bisulphite hydrochloric acid) is often necessary to free the bleached leather from brown manganese oxide precipitated upon it. No other oxidation method than those already described has turned out to be of any value for leather.

Notes on Processes, New Colors, etc.

REDUCTION BLEACH.

This method is in practice confined to the use of sulphurous acid. It is chiefly carried out with the gaseous oxide, and is generally used for fur-skins. The bleaching chamber is then worked exactly as in straw or silk bleaching. The liquid sulphurous bleach is prepared by dissolving sodium bisulphite in weak hydrochloric acid. The strength required varies within very wide limits and must be adjusted by an experienced leather bleacher. This is the disadvantage of wet sulphur bleaching as compared with the use of gas. Whether the dry or the wet process has been used it is most important to remember that the oil of vitriol, formed in the leather during the bleaching, which will destroy it if left in it, cannot be gotten rid of by simple rinsing. An alkaline bath must precede the rinsing, and if the sulphur bleach has not turned out well, the bath may advantageously take the form of a weak solution of sodium peroxide.

ACID BLEACH.

For this bleach, the leather is first freed from grease with alkali, preferably borax. A solution of 3 pounds of borax in 6 gallons of water is required for 100 pounds of average leather. After working the leather in this for a quarter of an hour it is drained, rinsed and bleached with a 4 per cent. solution of lactic acid. The bleach takes another fifteen minutes.

TOPPING METHODS.

The processes in which bleaching is avoided by what may be called a white dyeing method answer well with leathers which are already light colored, as they do not injure the leather, as bleaching is apt to do even under the most skilled hands, and are also cheaper. Dark colors, however, cannot be hidden, so that these methods are inapplicable in such cases. The oldest of those topping methods is to put the leather through alternate baths of sugar of lead and sulphuric acid, repeating the alteration until enough sulphate of lead has been precipitated on the fibre to hide

its natural color. If the leather be greasy it must be freed from fat before this treatment. Again, the baths both of sugar of lead, and of sulphuric acid must be weak, ½ to ¾ per cent. solutions at most, so that the leather will have to go to the baths several times. Yet another point is that the last bath must be a sugar of lead bath. This neutralises the free vitriol still in the leather and saves much rinsing.

Of late, tin-salt has been used in conjunction with white pigments, such as talc, blanc fixe, and pipe-clay. These pigments are also used alone being well rubbed into the leather, which is first thoroughly soaked.—*Der Gerber through Dyer and Calico Printer.*

PATENT BLUE AGL.

This is a member of the Patent Blue group which is especially recommended for the production of brilliant greenish blue fast lakes. It is suitable for the production of colors for lithographic inks and wall paper.

Precipitation:

FOR LITHOGRAPHIC COLORS.

A. 50 parts Aluminium Sulphate 18 per cent Al_2O_3
500 parts Water

B. 25 parts Soda Ash 58 per cent.
250 parts Water

C. 25 parts Patent Blue AGL
1000 parts Water

D. 75 parts Barium Chloride
750 parts Water

Make up the solutions and mix in the above order, precipitate at 100° F., wash twice.

FOR WALLPAPER COLORS.

50 parts Aluminium Sulphate 18 per cent Al_2O_3
500 parts Water

100 parts Barytes make into fine paste in above solution—add—

20 parts Soda Ash 58 per cent.
200 parts Water

20 parts Patent Blue AGL
1000 parts Water

Precipitate at 100° F. with:

75 parts Barium Chloride
750 parts Water

PART V

Educational

Educational

LOWELL TEXTILE SCHOOL.

CHEMISTRY AND DYEING DEPARTMENT.

When we look over the list of men that have graduated from the chemistry and dyeing department of the Lowell Textile School since its foundation, ten years ago, it is with no little satisfaction that we consider the practical success they have achieved and the satisfaction they have given to their employers.

The demand for graduates of this department continues and is constantly greater than the supply.

During the current school year 1907–1908, forty day students have been devoting their entire time to the regular chemistry and dyeing course, and at least eighty more that have taken some lecture and laboratory work in chemistry and dyeing. In addition there are fifty evening students in chemistry and dyeing.

OFFICERS OF INSTRUCTION FOR YEAR 1907–1908.

Louis A. Olney, Professor of Chemistry and Dyeing
J. B. Reed, Instructor in Analytical Chemistry
Robert R. Sleeper, Instructor in Dyeing and Industrial Chemistry
W. B. Pope, Instructor in General Chemistry
R. W. Hook, Instructor in Dyeing
G. A. Cushman, Instructor in General Chemistry.

The object of the Chemistry and Dyeing Department of the Lowell Textile School, is to give its students the following advantages:

1. A thorough education in general chemistry, both theoretical

and descriptive, including organic as well as inorganic chemistry.

2. A careful training in the general principles of analytical chemistry, both qualitative and quantitative, and their application in technical analysis.

3. A study of the general principles of chemical technology with special attention to those branches of industrial chemistry as are allied in any way to the textile and color industries, together with a large amount of laboratory work relating to the manufacture of the compounds used by the textile colorist and the treatment of waste materials.

4. An exhaustive study of textile chemistry, dyeing and textile printing, with the performance of an extended course of experimental and practical work in the laboratory and dyehouse, the school furnishing excellent facilities for the carrying out, upon the commercial scale, of the process studied in the class-room and laboratory.

5. An opportunity to make a detailed study or investigation of some special subject as a thesis previous to graduation.

The course in Chemistry and Dyeing is especially recommended to those who intend to enter any branch of textile coloring, bleaching or the manufacture or sale of the various dyestuffs or chemicals used in the textile industry. The training is so general, however, that it serves as an excellent foundation for every branch of chemical work.

The following curriculum of studies is being carried out during the year 1907–1908:

FIRST YEAR.

FIRST TERM.

(Common to all courses.)

	HOURS OF EXERCISE.		HOURS OF EXERCISE.
General Chemistry	187	Mechanical Drawing	97
Elements of Mechanism	60	Mathematics	30

LOWELL TEXTILE SCHOOL.

Subject	Hours of Exercise.	Subject	Hours of Exercise.
Hand Looms	55	Decorative Art	15
Freehand Drawing	15	German	20

English..............30

SECOND TERM.

Subject	Hours of Exercise.	Subject	Hours of Exercise.
Elementary Organic Chem.	30	Cloth Analysis	30
Textile Chemistry	15	Elements of Mechanism	60
Stoichiometry	30	Mathematics	30
Qualitative Analysis	195	Mechanical Drawing	38

German.............. 20

Options:

Free Hand Drawing — Decorative Art.

SECOND YEAR.

FIRST TERM.

Subject	Hours of Exercise.	Subject	Hours of Exercise.
Advanced Organic Chemistry	15	Dyeing Laboratory	150
Advanced Inorganic Chem.	30	Mechanics	30
Industrial Chemistry	120	Quantitave Analysis	112
Textile Chemistry & Dyeing	30	Power Loom Weaving	30

Dyeing Laboratory..........120

Chemico Physical Measurements—

Options:

Designing — Advanced Mathematics

Power Loom Weaving

THIRD YEAR.

FIRST TERM.

	HOURS OF EXERCISE.		HOURS OF EXERCISE.
Industrial Chemistry......	68	Dyeing Laboratory	157
Advanced Textile Chemistry and Dyeing......	30	Physical Chemistry	30
Electricity	10	Quantitative Analysis.....	135
		Finishing	45

SECOND TERM.

	HOURS OF EXERCISE.		HOURS OF EXERCISE.
Industrial Chemistry......	30	Quantitave Analysis	98
Physical Chemistry.......	20	Woolen and Worsted Finishing	45
Advanced Textile Chemistry and Dyeing.....	20	Calico Printing and Cotton Finishing	60
Dye Testing and Color Matching	80	Thesis	150

During the past year and at the present time special investigations are being made upon the following subjects.

The Aldehyde Derivatives of the Hydrosulphites and their uses as Discharging and Stripping agents.

The Photo-Micrographic Study of the Fibres.

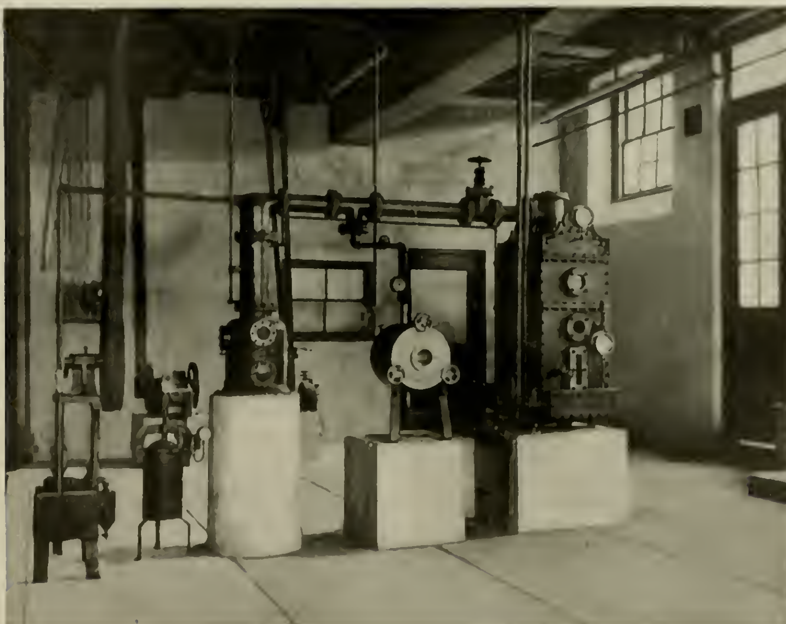
The Coloring of Leather.

The Relative Fastness of the Natural Dyestuffs as compared with the Coal-tar Colors.

Standard Methods of Dye-testing.

Indigo-disulpho acid.

The Reducile Vat Colors.



LOWELL TEXTILE SCHOOL.

Formic Acid and its Value to the Textile Industry.

More practical dyeing has been carried out during the past year than heretofore, owing to the greatly increased equipment which was installed last year. The work in Industrial Chemistry has been greatly increased and many chemicals manufactured and new experiments carried out in the newly equipped Industrial Laboratory.

PHILADELPHIA TEXTILE SCHOOL.

DEPARTMENT OF CHEMISTRY, DYEING AND PRINTING.

The Art of Dyeing is very old, dating back to hundreds of years before the Christian Era. The Science of Dyeing is new born and still in its childhood.

Solomon said, "There is nothing new under the Sun," but at that time there was no Coal-tar Color Industry and dyestuff manufacturers were not producing almost daily, substances, the like of which, did not occur in nature. At the present day such, however, is the case.

Therefore in order to keep abreast of the times, the man who is to have charge of color productions must be educated along the same general lines as the man who makes the dyes that he uses. Should the dyer or printer not have this scientific braining, he will constantly meet problems and have bad results, a satisfactory explanation for which he will not be able to give.

Moreover, it is not only necessary for the dyer to be able to produce a given shade but to do so in the most economical manner. To do this requires the testing and valuation of all products used and thus necessitates the services of a competent chemist.

It is the object of this School to give such a training; to give a sound fundamental education in the principles of pure, analytical, technical and applied chemistry and in the most approved methods of color production from the standpoint of the dyer, printer, manufacturer and purchaser.

This object is accomplished by lectures, recitations and an extensive amount of laboratory work in each subject pursued, together with practical dyeing and printing in the dye-house of the School which is unusually well equipped with machinery for the dyeing of yarn, warps, raw-stock and piece-goods. The printing laboratory is also well appointed and two roller-printing machines and a variety of engraved rollers are at the service of the students.

The course of study covers a period of three years and is outlined as follows:

FIRST YEAR—FIRST TERM.

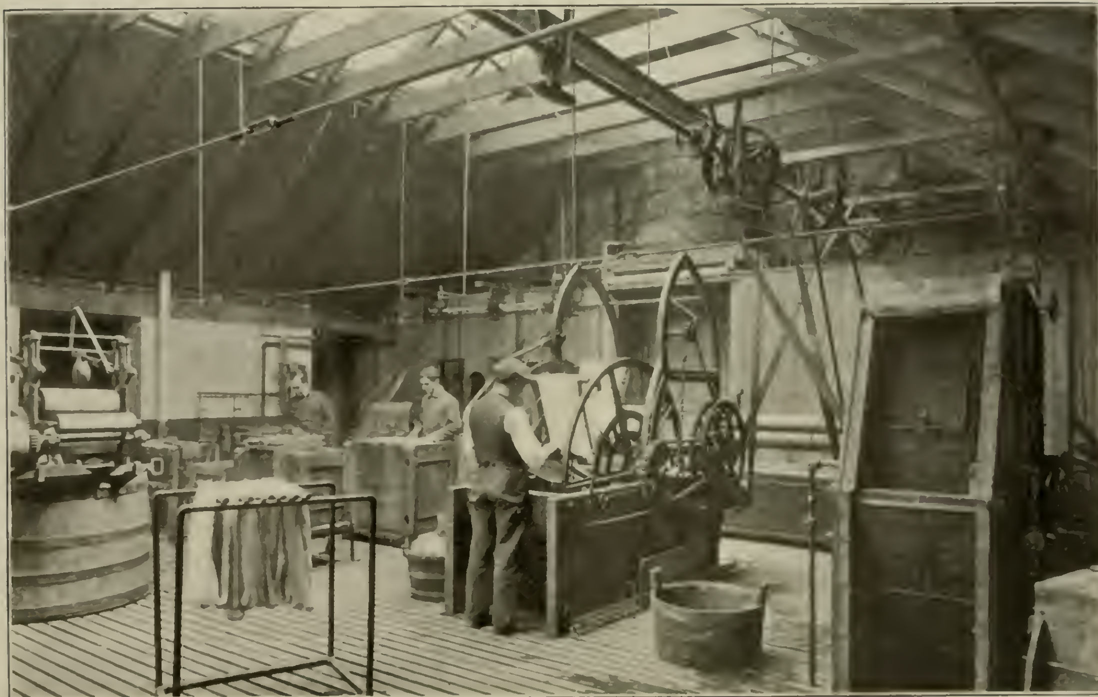
Chemistry I—General Inorganic.
Chemistry VI—Chemical Calculations.
Dyeing I—Physical and Chemical Properties of the Textile Fibres.
Dyeing II—Technology of Scouring and Bleaching.
Dyeing III—Principles of Dyeing—Elementary.

FIRST YEAR—SECOND TERM.

Chemistry II—Qualitative Analysis.
Chemistry VI—Chemical Calculations.
Dyeing III–IV—Principles of Dyeing—Elementry.
Dyeing V—Principles of Shade Compounding and Matching.

SECOND YEAR—FIRST TERM.

Chemistry III (A)—Quantitative Analysis—Gravimetric.
Chemistry IV—Organic—Aliphatic Series.
Chemistry X (A)—Textile Chemistry—Analysis of fibres, yarns and fabrics.
Dyeing VI—Color Mixing and Spectroscopy.
Dyeing VII—Principles of Dyeing—Intermediate.



PHILADELPHIA TEXTILE SCHOOL DYE HOUSE.

SECOND YEAR—SECOND TERM.

Chemistry III (B)—Quantitative Analysis—Volumetric.

Chemistry IV—Organic—Aromatic Series.

Chemistry X (B)—Textile Chemistry—Analysis of Dyestuffs and Mordant.

Chemistry VIII—Technical Seminar.

Dyeing VII—Principles of Dyeing—Intermediate.

THIRD YEAR—FIRST TERM.

Chemistry V—Industrial Chemistry.

Chemistry VII—Technical Analysis and Interpretation of Results.

Chemistry VIII—Technical Seminar.

Chemistry X (C)—Textile Chemistry—Testing of Dyestuff Reactions and Adulterations.

Dyeing VIII, IX, X—Principles of Dyeing and Advanced.

Dyeing XII—Textile Printing.

THIRD YEAR—SECOND TERM.

Chemistry V—Industrial Chemistry.

Chemistry VII—Technical Analysis.

Chemistry VIII—Technical Seminar.

Chemistry IX—Principles of Organic Syntheses.

Chemistry X (D)—Textile Chemistry—Testing Dyestuff Reaction on the fibre.

Chemistry XI—Chemistry of Dyestuff Manufacture.

Dyeing XI, XIII, XIV, XV—Principles of Dyeing advanced.

Dyeing XII—Textile Printing.

The School also offers evening courses in chemistry and dyeing on Monday, Wednesday and Friday evenings from October to March inclusive. The evening courses are designed to meet the needs of those employed during the day and their object is to cover in a general manner the subjects given in the regular day course.

THE BRADFORD DURFEE TEXTILE SCHOOL.

J. W. Bailey, Principal,

Fall River, Mass.

The Bradford Durfee Textile School is located at Fall River, Mass., the well known centre of the cotton goods industry in New England. While having an established reputation for the great production of print cloths, many of the Fall River mills are at present engaged in the extensive manufacture of the fine counts both plain and fancies.

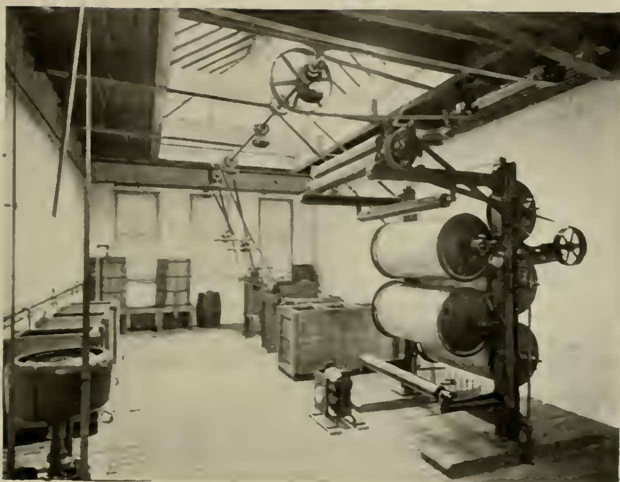
The School was opened in March, 1904, to the first day and evening students, and though at first looked upon by many as an experiment, has grown to fill an important place in the community as evidenced by the 534 students entrolled in our evening classes of the present year. Many workers in the factories come year after year to pursue the various subjects offered and their zeal and interest in the School is steadily increasing. Many of these workers have been promoted to responsible positions directly as a result of instruction at the School, and as nothing succeeds like success, their friends come to do likewise.

The graduates from the day classes have had good positions waiting for them in the factories and with the sellers and users of dyestuffs. The supply of graduates has not equalled the demand, and plans and suggestions for increasing the number of day students in the School are now under consideration.

There is a sentiment for free tuition for day as well as evening students, and the outlook is favorable that it will be in force another year.

Courses in Engineering have been given during the present year, and have proved very popular and productive of excellent results, while a cloth room and machine shop just completed, will be in use another season.

In the Dyeing Department the instruction is concentrated along practical as well as experimental lines, with a view of



BRADFORD-DURFEE TEXTILE SCHOOL DYE HOUSE.

associating practice with theory as far as is possible in a school. Particular stress is laid upon the commercial methods in chemical industries, this giving to the study of chemistry a living interest.

The age of the industrial and trade school is comparatively new in this country, but we feel it has come to stay, and the many problems as to what instruction, how much, and how to give it are being slowly worked out in conformity with the demands of the best practice in the textile industry.

BOOKS OF THE YEAR.

English and American.

THE CHEMISTRY OF COMMERCE.
By R. K. Duncan.
Harper & Bros., New York and London, 1907.

THE MANUFACTURE AND COMPARATIVE MERITS OF WHITE LEAD AND ZINC WHITE PAINTS.
Translated from the French by Donald Grant.
Scott, Greenwood & Son, London.
D. Van Nostrand Co., New York, 1907.

ALLEN'S COMMERCIAL ORGANIC ANALYSIS. VOL. II, PART III. ACID DERIVATIVES OF PHENOLS, AROMATIC ACIDS, RESINS AND ESSENTIAL OILS.
Revised by the Author and A. R. Tankard, F.C.S.
P. Blackiston's Son & Co., Philadelphia, 1907.

INDUSTRIAL ALCOHOL: THE PRODUCTION AND USE OF ALCOHOL FOR INDUSTRIAL PURPOSES AND FOR USE AS AN ILLUMINANT AND SOURCE OF MOTIVE POWER.
By J. G. McIntosh.
London, Scott, Greenwood & Son to New York, D. Van Nostrand Co., 1907.

PRACTICAL PAPER MAKING—A MANUAL FOR PAPER MAKERS (Second Edition).
By George Clapperton.
London, Crosby, Lockwood; New York, D. Van Nostrand Co., 1907.

THE TEXTILE FIBRES: THEIR PHYSICAL, MICROSCOPICAL AND CHEMICAL PROPERTIES (Second Edition).
By J. Merritt Matthews, Ph.D.
John Wiley & Sons, New York, 1907.

PART VI

List of Dyestuffs Makers and Methods

List of Dyestuffs, Makers and Methods

ABBREVIATIONS USED TO INDICATE THE DYESTUFF MANUFACTURERS AND THEIR AGENTS.

(A) Berlin Aniline Works, 213–215 Water St., New York; 122 Walnut St., Philadelphia, 124 Pearl St., Boston; 220 E. Kinzie St., Chicago; 9 E. Pearl St., Cincinnati; 23 S. Tryon St., Charlotte, N. C. American agents for the Actiengesellschaft für Anilinfabrikation in Berlin.

(A A C) American Color & Chemical Co., Albany, N. Y. Agent (At). Consolidated with H. R. W.

(A C) Anchor Color Mfg. Co., 462 Cherry St., New York.

(A M) Actiengesellschaft für Chemische Industrie, Mannheim, Germany.

(Ash) T. C. Ashley & Co., 145 Milk St., Boston.

(At) F. E. Atteaux & Co., 176 Purchase St., Boston; 176 Fulton St., New York; 17 Kinzie St., Chicago; West Fulton St., Gloversville, N. Y.; 53 Colborne St., Toronto, Ontario; 15 Lemoine St., Montreal, P. Q.

(B) Badische Anilin und Sodafabrik, Ludwigshafen am Rhein, Germany. Agent (P K).

(B A Co.) British Alizarine Co., Ltd., Silverton, Victoria Docks, London, England. Agent (Bch).

(Bai) Bairstow & Co., 211 Pearl St., New York.

(B C F) Basler Chemische Fabrik, Basel, Switzerland.

(Bch) Beach & Co., Hartford, Conn Agents for (B A Co.). (Br S), (E F W), (Grie) and (Rh).

(Bd) J. A. & W. Bird & Co., 43 Cedar St., New York. Agents for (ClCo) and (LD).

(B E) C. vom Bauer, Elberfeld, Germany.

(B K) Leipziger Anilinfabrik Beyer und Kegel, Leipzig, Germany. (Closed).

(B L) Bosson & Lane, 36 Central Wharf, Boston, Mass.

(Br S) Brooke, Simpson & Spiller, Ltd., Hackney Wick, London, England. Agents (Bch).

(Bs) C. Bischoff & Co., 451–453 Washington St., New York, 229 N. Front St., Philadelphia; 124–126 Purchase St., Boston; 10 Weybosset St., Providence; 196 Michigan St., Chicago; 416 St. Paul St., Montreal. Agents for (D) and (L).

(Bt) F. Bredt & Co., 194 Fulton St., New York; 12 S. Front St., Philadelphia. Agents for (K B).

(By) Farbenfabriken, vormals Fried. Bayer und Co., Elberfeld, Barmen, Schleploh, Leverkusen, Germany; Flers, France; Moscow, Russia. American agents, Farbenfabriken of Elberfeld Company, 66 Lafayette St., New York; 32 India St., Boston; 27 Pine St., Providence; 9–11 N. Water St., Philadelphia; 133 E. Kinzie St., Chicago; 509–13 Trust Building, Charlotte, N. C.; 14 Front St., East, Toronto, Can.

(C) Leopold Cassella & Co., G.m.b.H., Frankfort-am-Main, Germany. Manufacture Lyonnaise de Matieres Colorantes, Lyons, France, and Russische Anilinfarbenfabrik, Riga. Agent (Math).

(C D C) Central Dyestuff and Chemical Co., Plum Point Lane, Newark, New Jersey.

(C J) Carl Jäger Anilinfarbenfabrik, Barmen, Germany.

(Cl Co) The Clayton Aniline Co., Ltd., Clayton, Manchester, England. Agents (Bd), (Mz).

(C R) Claus & Rée, Droylsden, Manchester, England.

(C V) Colne Vale Chemical Co., Milnsbridge, Huddersfield, England.

(Cz) John Casthelaz, Bruère & Co., Belbeuf, Rouen, France.

(D) Farbenfabrik Dahl & Co., Barmen, Elberfeld, Germany. Wülfing, Dahl & Co., Inc., successors. Agents (Bs).

(D H) Farbwerke vormals Durand, Huguenin & Co., Basel and Hüningen; Jersey City, N. J.

(D W) L. Destree, A. Wiescher & Co., Haeren near Brussels, Belgium.

(E F W) Elton Fold Works, Bury, Lancashire, England. Agent (Beh).

(E H) E. de Haen, List, near Hanover, Germany.

(F) Farbwerk Friedriensfeld, Mannheim, Germany.

(F G B) F. G. Brown, 112 N. Delaware Ave., Philadelphia.

(Fi) Alfred Fischesser & Co., Muhlhausen, Elsass, Germany. (Closed).

(F T M) Fabriques de Produits Chimiques de Thann et de Mulhouse, Alsace, Germany.

(G) Aniline Color and Extract Works, formerly John R. Geigy, Basle and Grenzach, Switzerland; Rouen, France; Moscow, Russia. Agent (Kell).

(Gau) Gauhe & Co., Eitdorf, Germany.

(Gb) Anilinfarbenwerk, vormals A. Gerber & Co., Basle, Switzerland. Absorbed by (I).

(Gei) Geisenheimer & Co., 189 Front St., New York; 19 Pearl St., Boston; 136 Chestnut St., Philadelphia; 391 Peachtree St., Atlanta, Ga. Agents for (O).

(GP) George Pickering, Elmira, New York.

(Gr) Rob. Graesser Chemical Works, Ruabon, North Wales.

(Grie) Farbwerke Griesheim, Germany. Agent (Beh).

(Gt) Gilbert Aniline Co., Philadelphia.

(H) Read Holliday & Sons, Ltd., Huddersfield, England; 7 Platt St., New York; 125 Pearl St., Boston; 107 North Second St., Philadelphia.

(H M) Heller & Merz Co., Newark, N. J.; 22 Cliff St., New York.

(H R W) Hudson River Anilin Color Works, Albany, N. Y. Agent (By).

(H S) The Hanna-Schoelkopf Co., Schoelkopf, Hartford & Hanna Co., successors.

(I) The Society of Chemical Industry, Basle, Switzerland. Agent (Klp).

(In) Innis & Co., Innis, Spieden & Co., successors, 120 William St., New York; 36 Strawberry St., Philadelphia; 161 Kinzie St., Chicago.

(Jb) J. B. Ibels, Brussels, Belgium (Closed).

(J H) J. Hauff, Stuttgart, Germany.

(Jy) O. S. Janney & Co., 17 N. Water St., Philadelphia; 70 Kilby St., Boston.

(K) Kalle & Co., Inc., Biebrich-am-Rhein, Germany: 530 Canal St., New York; 145 Pearl St., Boston; 37 Letitia St., Philadelphia.

(Kar) Ph. H. Karcher & Co., 14 Cedar St., New York. Closed.

(K B) Küchler & Buff, Crefeld, Germany. Agent (Bt).

(Kell) Geigy Aniline and Extract Company, successors to John J. Keller & Co., 69 Barclay St., New York; 135 Pearl St., Boston; 46 North Front St., Philadelphia; 18 Prior St., Atlanta, Ga.; 56 S. Water St., Providence. Agents for (G).

(Ki) Kinzelberger & Co., Prague, Austria.

(Klp) A. Klipstein & Co., 122 Pearl St., New York; 50-52 N. Front St., Philadelphia; 283–85 Congress St., Boston; 136 Kinzie St., Chicago; 13 Mathewson St., Providence; 24 Catherine St., North, Hamilton; 17 Lemoine St., Montreal, Can. Agents for (I) and (N).

(L) Farbwerk Mühlheim, vormals A. Leonhardt & Co., Mühlheim-am-Main, Germany. Agent (Bs).

(L D) Lepetit, Dollfus e Gansser, Susa, Milan, Italy. Agt. (Bd).

(Lev) Levinstein, Limited, Manchester, Blackley and Crumpsall, England. American Branches, I. Levinstein & Co., Boston; 219 N. Front St., Philadelphia.

(L F) L. B. Fortner, 36–38 Strawberry St., Philadelphia.

(L L) John W. Leitch & Co., Milnsbridge, England.

(L M) Leeds Mfg. Co., Brooklyn, N. Y.

(Lo) Charles Lowe & Co., Stockport, England.

(L P) Lucien Picard & Co., St. Fons, Lyons, France. Operated by (A).

(L Sch) Lembach & Schleicher, Biebrich-am-Rhein, Germany.

(Ly) Thomas Leyland & Co., 60 India St., Boston, Mass.; 121 N. Front St., Philadelphia, Pa.

(tM) Chemische Fabriken, vorm. Weiler-ter Meer. Uerdingen, Germany. C. F. Müller, 100 William St., New York City.

(M) Farbwerke, vormals Meister, Lucius & Brüning, Höchst-am-Main, Germany, Creil and Moscow. Agent (Mz).

(Math) Cassella Color Co., successors to W. J. Matheson & Co., Ltd., 182–184 Front St., New York; 126–128 S. Front St., Philadelphia; 68 Essex St., Boston; 64 Exchange Place, Providence; 47 N. Pryor St., Atlanta, Ga.; 86-88 Youville Square, Montreal.

(Mo) Société Chimique des Usines du Rhone, formerly Gillard P. Monnet & Cartier, St. Fons, Lyons, France.

(Mz) H. A. Metz & Co., successors to Victor Koechl & Co., 122 Hudson St., New York; 140–142 Oliver St., Boston; 104 Chestnut St., Philadelphia; 23 South Main St., Providence; 4 N. Clark St., Chicago; 210 S. Tryon St., Charlotte, N. C.; Empire Bldg., Atlanta, Ga.; Dock and Brown Sts., Newark, N. J.; 1025 Bryant St., San Francisco, Cal.; 55 St. Francois Xavier St., Montreal, Can.; 28–30 Wellington St. West, Toronto, Can.; Hamburg, Germany. Agents for (M), (W C B), (Cl Co).

(N) Carl Neuhaus, Elberfeld, Germany. Agent (Klp).

(Nat) National Dye Co., Philadelphia.

(N I) Farbwerk W. Noetzel, Istel & Co., Griesheim-am-Main, Germany.

(N Y B) New York & Boston Dyewood Co.

American Dyewood Company, successors, 156 William St., New York: 648 Bourse, Philadelphia; Boston, 115 High St.; Hamilton. Ontario.

(O) K. Oehler, Anilin u. Anilinfarbenfabrik, Offenbach-am-Main, Germany. Successors, Chemische Fabrik Griesheim-Elektron. Agent (Gei).

(P) Société Anonyme des Matières Colorantes et Produits

Chimiques de St. Denis, France. A. Poirrier and G. Dalsace, Paris. Agent (S S).

(P C) Theodore Peters, Chemnitz, Germany.

(P K) Kuttroff, Pickhardt & Co., successors to Wm. Pickhardt & Kuttroff, successors Badische Company, 128 Duane St., New York; 86 Federal St., Boston; 80 S. Water St., Providence; 238 Arch St., Philadelphia; 228 Randolph St., Chicago; 6 Lemoine St., Montreal, Can. Agents for (B).

(P L) Pick, Lange & Co., Amersfoort, Holland. Closed. Chemische Fabreik Amersfoort successors.

(P S) Ferd, Petersen & Co., Schweizerhalle, Basle, Switzerland.

(R) Joh. Conr. Reihlen, Friedensau, Neuhofen, Germany.

(Rice) C. F. Rice, 174 Summer St., Boston.

(R D) Roberts, Dale & Co., Manchester and Warrington, England.

(R E) Remy, Erhart & Co., Weissenthurm-am-Rhein, Germany. Agent, Fr. Schroeder, 100 William St., New York.

(R F) Ruch et Fils, Pantin, France.

(Rh) Société Chimique des Usines de Rhone, France. Agent (Bch). See (Mo).

(S) Chemical Works formerly Sandoz, Basle, Switzerland.

(S B) A. Sevoz & Boasson, Lyons-Vaise, France.

(Sch) Schoellkopf, Hartford & Hanna Co., successors to the Schoellkopf Aniline & Chemical Co., Buffalo, N. Y.: 100 William St., New York. Selling agents, National Aniline and Chemical Co., New York, 100 William St.; Philadelphia, 109 N. Water St.; Boston, 36 Purchase St.; Providence, 28 N. Main St.; New Haven, Conn., 211 Water St.; Cincinnati, 232 E. Pearl St.; Chicago, 110 Michigan St.; Milwaukee, 175 Clinton St.; Kansas City, 413 W. 5th St.; Minneapolis, 114 Second St., North.

(SS) Walter F. Sykes & Co., 85 Water St., New York; 113 Broad St., Boston; 132 Chestnut St., Philadelphia. Agents for (P).

(St) The Stamford Mfg. Co., 133–137 Front St., New York.

(Th) E. M. Thayer & Co., 411 Atlantic Ave., Boston, Mass.

(U I) United Indigo & Chemical Co., 176 Federal St., Boston.

(V) Verein Chemischer Fabriken in Mannheim, Germany. Agent, Roessler & Hasslacher Chemical Co., 100 William St., New York.

(Va) H. S. Vila, 115 S. Second St., Philadelphia, Pa.

(W) Williams Bros., Hounslow, Middlesex, England.

(W C B) W. C. Barnes & Co., Ltd., Hackney Wick, London, England. Agent (Mz).

(Z) Friedrich Zimmer, Mannheim, Germany.

DYEING METHODS.

For economy of space, in order that the information may be more readily found, the dyeing methods are given by certain suggestive letters in accordance with the following:

WA indicates wool is dyed in acetic acid.

WN means that wool is dyed in a neutral bath.

WG indicates that wool is dyed in a bath containing Glauber's salt.

WGS means that wool is dyed with Glauber's salt and sulphuric acid in the bath.

WGSCh indicates that wool is first dyed with Glauber's salt and sulphuric acid in the bath and the color then developed with chrome.

WACh means that wool is first dyed with acetic acid and chrome added to develop the color.

WCh indicates that chromed wool is used with the dye.

SA means that silk is dyed in a bath acidified with acetic acid.

SS means that silk is dyed in a bath acidified with sulphuric acid.

CT indicates that the dyestuff is used on cotton mordanted with tannin.

CD means that cotton is dyed direct in one bath.

CDv indicates that the color is developed on cotton by subsequent treatment after direct dyeing.

CAl indicates cotton dyed with alum and Glauber's salt.

CWD—cotton and wool mixed goods dyed in one bath.

SULPHUR denotes one of the class of sulphur dyes requiring special treatment.

These extremely brief directions are used for the further reason that the dye manufacturers themselves prefer that specific information be obtained from their offices. In many places no dyeing suggestions are given on this account.

LIST OF DYESTUFFS, MAKERS AND METHODS.

Name of Dye.	Agent or Maker.	Dye Method.
Acetine Blue	PK	Printing
Acetinduline R	Mz	Printing
Acetopurpurine 8B	A	CD
Acetylene Blue 6B, 3B, Bx, 3R	Klp	CD
Acetylene Pure Blue	Klp	CD
Acid Alizarine Black 3B, 3Bex	Mz	WGSCh
Acid Alizarine Black R, AC, RH	Mz	WGSCh
Acid Alizarine Black SE, SET paste	Mz	WACh
Acid Alizarine Black SE, SET powder	Mz	WACh
Acid Alizarine Black SN, SNT	Mz	WGSCh
Acid Alizarine Black T	Mz	WGSCh
Acid Alizarine Blue BB	Mz	WGSCh
Acid Alizarine Blue GR, SV	Mz	WGSCh
Acid Alizarine Blue Black B, 3B	Mz	WGSCh
Acid Alizarine Brown B, BB, RH, RP	Mz	WGSCh
Acid Alizarine Dark Blue SN	Mz	WGSCh
Acid Alizarine Garnet R	Mz	WGSCh
Acid Alizarine Gray G	Mz	WGSCh
Acid Alizarine Green B	Mz	WGSCh
Acid Alizarine Green G	Mz	WGSCh
Acid Alizarine Grenade R	Mz	WGSCh

Name of Dye.	Agent or Maker.	Dye Method.
Acid Alizarine Red B, G	Mz	WGSCh
Acid Alizarine Violet N	Mz	WGSCh
Acid Alizarine Yellow O, RC	Mz	WGSCh
Acid Anthracene Brown T, G, RH ext.	By	WGSCh
Acid Anthracene Red, G, BB	By	WGSCh
Acid Black	Mz	WGS
Acid Black B	AAC	WGS
Acid Black BE new	Klp	WGS
Acid Black B No. 4	AC	WGS
Acid Black 5B, 8B, FL	By	WGS
Acid Black 10B	Sch	WGS
Acid Black C, 3BL, T	Klp	WGS
Acid Black 77	AC	WGS
Acid Black 2531	Kell	SS
Acid Black 5534	H	WGS
Acid Black 5535	H	WGS
Acid Black J	NYB	WGS
Acid Black S, 3G	H	WGS
Acid Blue AA	Kell	WGS
Acid Blue BB	Sch	WGS
Acid Blue GG	Sch	WGS
Acid Blue FS, 466, GS	Mz	WGS
Acid Blue 76	Sch	WGS
Acid Blue 100	Sch	WGS
Acid Blue R	NYB	WGS
Acid Blue Black 3B	By	WGS
Acid Brown	Bs	WGS
Acid Brown D	Math	WGS
Acid Brown G	A	WGS
Acid Brown R	A	WGS
Acid Brown Y	Sch	WGS
Acid Carmoisine B	Bk	WGS
Acid Carmoisine 6B	H	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Acid Cerise	Mz. S S	WGS, SS
Acid Cerise O, ii	Mz	WGS, SS
Acid Chrome Black BG, WS, TC	By	WGSCh
Acid Chrome Brown T	By	WGSCh
Acid Crimson	Bs	WGS
Acid Cyanine B, BD, BF, G, CD, GF	A	WGS
Acid Cyanine BR	By	WGS
Acid Eosine G	Mz	WGS
Acid Fuchsine	Mz, Bs, Klp	WGS
Acid Fuchsine S B	PK	WGS
Acid Green	By, Klp, O	WGS, SS
Acid Green B	P	WGS
Acid Green 2B	P	WGS
Acid Green 3B, 6B	By, P	WGS
Acid Green 4B	P	WGS
Acid Green bluish	NI	WGS, SS
Acid Green conc.	Mz	WGS
Acid Green conc. D	Mz	WGS
Acid Green conc. G	Mz	WGS
Acid Green conc. M	Mz	WGS
Acid Green conc. ii	Mz	WGS
Acid Green D	Mz	WGS, SS
Acid Green EC	Mz	WGS, SS
Acid Green extra conc. B	Math	WGS, SS
Acid Green extra conc. paste	Math	
Acid Green GG	H	WGS
Acid Green 5G	Math	WGS
Acid Green J	P	WGS
Acid Green JEEE	P	WGS
Acid Green M	Mz	WGS, SS
Acid Green M., 5 fold conc.	Mz	WGS
Acid Green O	Mz	WGS
Acid Green OG	O	WGS, CT

Name of Dye.	Agent or Maker.	Dye Method.
Acid Green 780	Math	WGS
Acid Grenadine	Kell	WGS
Acid Grenadine B	Kell	WGS
Acid Indigo Blue	Mz, H	WGS
Acid Magenta	Mz	PK, SS, WGS, SS
Acid Magenta B	Mz	WGS, SS
Acid Magenta BC Crystals	Kell	WGS, SS
Acid Magenta Crystals	Mz	WGS, SS
Acid Magenta GC Crystals	Kell	WGS, SS
Acid Magenta O	Mz	WGS, SS
Acid Marine Blue A	Math	WGS
Acid Maroon O	Mz	WGS, SS
Acid Methyl Violet S7B	PK	WGS
Acid Milling Scarlet	Br S	WGS
Acid Naphthol Orange		WGS
Acid Navy Blue	Bd	WGS
Acid Orange G	Kell	WGS, SS
Acid Phosphine JO	C	Leather
Acid Phosphine GO	Mz	Leather
Acid Phosphine BRO	Mz	Leather
Acid Ponceau	Klp	WGS
Acid Rhodamine R, 3R	Klp	WGS
Acid Rosamine A pat	Mz	WGS, SS
Acid Rubin (see Fuchsine Ex. S)		WGS, SS
Acid Rubin SB	PK	WGS
Acid Rubine BBR	Mz	WGS
Acid Ruby	Klp	WGS
Acid Sky Blue	At	WGS
Acid Violet 2B	Kell, PK	WGS
Acid Violet 3B extra BW	By	WGS
Acid Violet bluish	Kell	WGS
Acid Violet BN, 2BN	PK	WGS
Acid Violet 4B extra	By, A	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Acid Violet 4BN	Klp, PK	WGS
Acid Violet 4BS	Math	WGS, SS
Acid Violet 4BX	By	WGS
Acid Violet 5B extra	Kell	WGS
Acid Violet 5BF	Mz	WGS
Acid Violet 5BFI	Mz	WGS
Acid Violet 5BS	At	WGS
Acid Violet 5BX	Math	WGS
Acid Violet 6B	A, By, Kell, G	WGS
Acid Violet 6BC	Sch	WGS
Acid Violet 6BF	Mz	WGS
Acid Violet 6BIN	Mz	WGS
Acid Violet 6BN	Klp, PK	WGS, SS
Acid Violet 6BS	Mz	WGS
Acid Violet 7B	Mz, Klp, PK,	WGS, SS
Acid Violet 7BN	Mz	WGS
Acid Violet Double	Kell	WGS
Acid Violet N	Mz	WGS
Acid Violet R	O	WGS
Acid Violet R conc.	Mz	WGS
Acid Violet R extra	By	WGS
Acid Violet R R	Kell	WGS
Acid Violet 2R extra	By	WGS
Acid Violet 3R extra	By	WGS
Acid Violet 3RA	Mz	WGS
Acid Violet 3RS	Mz	WGS
Acid Violet 4R	Klp, PK	WGS
Acid Violet 4RN	PK	WGS
Acid Violet 4RS	Mz	WGS
Acid Violet 6R	Sch.	WGS
Acid Violet S7B	PK	WGS
Acid Violet S4R	PK	WGS
Acid Violet VSW	O	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Acid Violet ii	Mz	WGS
Acid Violet 118	HS	WGS
Acid Yellow	Mz, A, Klp, Math, O, SS,	WGS
Acid Yellow Crystals	Mz, Math	WGS
Acid Yellow AT	Math	WGS
Acid Yellow D	A	WGS
Acid Yellow G		
Acid Yellow RS	Bs	WGS
Acid Yellow S, see Naphthol Yellow	S.	
Acid Yellow 8S22	H	WGS
Acme Brown	Math	CT
Acme Yellow	Mz	WGS, SS
Acridine Gold Yellow, G	Bs	CT
Acridine Orange	Mz	SA, CT
Acridine Orange G	Bs	CT
Acridine Orange NO	Mz	CT
Acridine Orange R extra	Mz	CT
Acridine Red B, 2B, 3B	Mz	CT
Acridine Scarlet R, 2R, 3R	Mz	CT
Acridine Yellow	Mz, Bs	SA, CT
Agalma Black 4B	B	WGS
Agalma Green B	B	WGS
Alcohol Blue	S, Bs, By, Mz, PK, SS	
Alcohol Blue SFC	K.	
Alcohol Eosine	tM.	
Algol Blue CF, 3G	By	Vat
Algol Green B	By	Vat
Algol Red B	By	Vat
Alizadine Brown R, W, Y	H	WGSCh
Alizadine Chocolate	H	WGSCh
Alizarine Anthrol Blue NR	Mz	WCh
Alizarine Astrol B	By	WGS, WCh
Alizarine Black Bayer FB, NG, GA	By	WGSCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Black 4B	Math	WA
Alizarine Black 4BN	Math	WA
Alizarine Black 4BR	Math	WA
Alizarine Black 4BS	Lev	WA
Alizarine Black 6B	Math	WA
Alizarine Black CB, CT	Mz	WGSCh
Alizarine Black D	Math	WA
Alizarine Black DAC	Mz	CDv
Alizarine Black DCB	Mz	CDv
Alizarine Black DCR	Mz	CDv
Alizarine Black DE	Mz	CDv
Alizarine Black DG	Mz	CDv
Alizarine Black DHW	Mz	CDv
Alizarine Black DN	Mz	CD
Alizarine Black DPG	Mz	CDv
Alizarine Black DPR	Mz	CDv
Alizarine Black DR	Mz	CDv
Alizarine Black DRN	Mz	CD
Alizarine Black DT	Mz	CDv
Alizarine Black DYG	Mz	CDv
Alizarine Black G	Me, By	WCh
Alizarine Black P	Mz	WCh
Alizarine Black R	Bs, Math	WCh
Alizarine Black RT	Mz	CDv
Alizarine Black S	Mz, Math, PK	WCh
Alizarine Black SRA	PK	WCh
Alizarine Black SW, WB	PK	WCh
Alizarine Black T	Math	WCh
Alizarine Black TBA	A	WGSCh
Alizarine Black, WB extra, SW	B	WCh
Alizarine Black WX extra	PK	WACh
Alizarine Blue A	Mz	WCh
Alizarine Blue A B	B A Co	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Blue Black 3B, B	By	WCh
Alizarine Blue Black WB extra	B	WACh
Alizarine Blue ASR	B	WCh
Alizarine Blue B R 3 G	By	WCh
Alizarine Blue C G, CRR, CWRR	By	WCh
Alizarine Blue CRW	SS	WCh
Alizarine Blue CS	Math	WCh
Alizarine Blue DB	Mz	CD
Alizarine Blue DBX	Mz	CD
Alizarine Blue DE	Mz	CD
Alizarine Blue DET	Mz	CD
Alizarine Blue DG	Mz	CD
Alizarine Blue D N	Mz	WCh
Alizarine Blue D N W	Mz	WCh
Alizarine Blue D N X	Mz	WCh
Alizarine Blue DR, D2R, D4R	Mz	CD
Alizarine Blue E, A	Mz	WCh
Alizarine Blue G	Mz	WCh
Alizarine Blue G B, P L	AC	WCh
Alizarine Blue G N	Bs	WCh
Alizarine Blue G S	At	WCh
Alizarine Blue G T	Bs	WCh
Alizarine Blue GW, JR	By	WCh
Alizarine Blue J G	HS	WCh
Alizarine Blue NGG powder	PK	WCh
Alizarine Blue N S	By	WCh
Alizarine Blue O D R	At	WCh
Alizarine Blue paste	Mz	WCh
Alizarine Blue R	Mz	WCh
Alizarine Blue RR	Mz	WCh
Alizarine Blue S A P, SKY, SAE	By	WGS, WCh
Alizarine Blue S paste	PK	WCh
Alizarine Blue S powder	PK	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Blue SB powder, paste	Mz	Printing
Alizarine Blue SBW powder	Mz	WCh
Alizarine Blue SCA	Ac	WCh
Alizarine Blue SR powder, paste	Mz	Printing
Alizarine Blue S2R powder, paste	Mz	Printing
Alizarine Blue soluble powder ABS	B A Co	WCh
Alizarine Blue Black B, 3B	By	WCh
Alizarine Bordeaux B in paste	By	WCh
Alizarine Bordeaux B D in paste	By	WCh
Alizarine Bordeaux P	Mz	WCh
Alizarine Bordeaux C	Me	WCh
Alizarine Bordeaux G, GG	By	WCh
Alizarine Brown	Mz, By, PK	WCh
Alizarine Brown AS	Klp	WCh
Alizarine Brown DB	Mz.	CD
Alizarine Brown DBD	Mz.	CD
Alizarine Brown DD	Mz	CD
Alizarine Brown, DG, D2G, D3GO, D3GI	Mz	CD
Alizarine Brown DM	Mz	CD
Alizarine Brown DR	Mz	CD
Alizarine Brown DX	Mz	CD
Alizarine Brown G	Mz	WCh
Alizarine Brown GN, AW, AT	By	WCh
Alizarine Brown O DR	At	WCh
Alizarine Brown paste	Mz	WCh
Alizarine Brown powder	Mz, By	WCh
Alizarine Brown O, F, N	Mz	WCh
Alizarine Brown R	Mz, Me, Rice	WCh
Alizarine Brown R B	By	WCh
Alizarine Brown S O	PK	WCh
Alizarine Brown Y	By	WCh
Alizarine Cardinal	By	

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Carmine	B A Co	WCh
Alizarine Carmine Blue B, G	By	WCh
Alizarine C A	B A Co	WCh
Alizarine Claret DB, DG	Mz	CD
Alizarine Claret R paste	Mz	WCh
Alizarine Coelestol R	By	WGS, WCh
Alizarine Cyanine G paste	By	WCh
Alizarine Cyanine Green 3G	By	WGSCh
Aliz. Cyanine R, 2R, 3R, RA extra	By	WCh
Alizarine Cyclamen R paste	By	Printing
Alizarine Dark Blue	PK	WCh
Alizarine Dark Blue, D, DR	Mz	CD
Alizarine Dark Blue D3R	Mz	CD
Alizarine Dark Blue S	Mz	WCh
Alizarine D G, GI	PK	WCh
Alizarine Emeraldole G	By	WGS
Alizarine Fast Black SP	By	WCh
Alizarine Fuchsine BD	By	WCH, WGS
Alizarine Gray SP	By	Printing
Alizarine Green paste	Pk	WCh
Alizarine Green B	Bs	WCh
Alizarine Green B	A	WA
Alizarine Green C, SS	By, Rice	WCh
Alizarine Green CE paste, CG, CK	By	WGS, WCh
Alizarine Green DW	PK	WCh
Alizarine Green EB, G	Bs	WCh
Alizarine Green F	A	WACh
Alizarine Green F powder	Sch	WCh
Alizarine Green KO	By	Sulphur
Alizarine Green S paste	Mz	WCh
Alizarine Green SE	Mz, PK	WCh
Alizarine Green S pat	Math	WCh
Alizarine Grenat R	Mz	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Indigo DO	Mz	CD
Alizarine Indigo S paste	PK	WCh
Alizarine Irisol R	By	WGS, WCh
Alizarine Lanacyl Blue BB, 3B	Math	WCh
Alizarine Lanacyl Navy Blue B pat	Math	WA
Alizarine Lanacyl Blue R	Math	WA
Alizarine Lanacyl Violet B pat	Math	WA
Alizarine Maroon paste	PK	WCh
Alizarine Olive OD	At	WCh
Alizarine Orange A paste	PK	WCh
Alizarine Orange AO, AOP	B A Co	WCh
Alizarine Orange DF, DG, DR	Mz	CD
Alizarine Orange G	Mz, By	WCh
Alizarine Orange N, O	Mz	WCh
Alizarine Orange powder	Mz	WCh
Alizarine Orange P	Mz	WCh
Alizarine P	B A Co	WCh
Alizarine Red D4B	Mz	CD
Alizarine Red E D	Bs	WCh
Alizarine Red F paste 4F, 5F	Mz	WCh
Alizarine Red GG	PK	WCh
Alizarine Red PS	By	WCh
Alizarine Red RG	Mz	WCh
Alizarine Red RX	Mz	WCh
Alizarine Red S	Mz, PK	WCh
Alizarine Red SDG	Mz	WCh
Alizarine Red WB	By, PK	WCh
Alizarine Red WS	Mz	WCh
Alizarine Red X	Mz	WCh
Alizarine Red D1B new, D4NB	Mz	WCh
Alizarine Red No. 1 powder	Mz	WCh
Alizarine Red 2A	Mz	WCh
Alizarine Red 2ABL, BL	Mz	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Red 2 BW	Mz	WCh
Alizarine Red 1 W	Mz	WCh
Alizarine Red 1 WS	Mz	WCh
Alizarine Red 2 A W	Mz	WCh
Alizarine Red 2W	Mz	WCh
Alizarine Red 2 WS	Mz	WCh
Alizarine Red 3 GW	Mz	WCh
Alizarine Red 3W	Mz	WCh
Alizarine Red 3 WS	Mz	WCh
Alizarine Red 4 FW	Mz	WCh
Alizarine Red 4 WS	Mz	WCh
Alizarine Red 5 WS	Mz	WCh
Alizarine Rubinol R	By	WCh
Alizarine Saphirol SE	By	WGS
Alizarine Saphirol B	By	WGS
Alizarine Scarlet DG, D2R	Mz	CD
Alizarine Sky Blue B	By	WGS
Alizarine Violet extra	At	WCh
Alizarine Violet G paste	Mz	WCh
Alizarine Violet N	St	WCh
Alizarine Violet B	Bs	WCh
Alizarine Violet paste	Mz	WCh
Alizarine Viridine paste FF	By	WCh
Alizarine Yellow A paste	PK	WCh
Alizarine Yellow C	Bs	WCh
Alizarine Yellow DG, DR, D3G, DOO	Mz	CD
Alizarine Yellow DR	Bs	WCh
Alizarine Yellow FS	Klp	WCh
Alizarine Yellow GG, GGW, N	Mz	WCh
Alizarine Yellow GG	A	WACh
Alizarine Yellow GG	Lev	WGS
Alizarine Yellow KS	Mz	WCh-Printing
Alizarine Yellow LW	PK	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Alizarine Yellow O, paste, R, RW powder	Mz	WCh
Alkali Blue	A, Brs, Bs, By, Sch, Kell, Klp, Math, O, PK, SS.	
Alkali Blue B, 2B, 3B, 4B, 5B, 6B, 7B, BBR, R, R conc. extra	Mz.	
Alkali Blue B, 2B, 3B, 4B, 5B, 6B, 6B90 per cent., 6B, 100 per cent., R, 2R, 3R	Math.	
Alkali Blue 2B, 3B, 4B, 5B, 6B, H6B, H5BOO, H3BOO	O.	
Alkali Blue D	A.	
Alkali Blue 4B	Jb.	
Alkali Blue XG	Br. S.	
Alkali Brown	Bs	CD
Alkali Brown R	LP	CD
Alkali Fast Green B, G, 3B	By	WGS
Alkali Fast Red B, G	Mz	WGS
Alkali Green	Br. S.	
Alkali Red	Bs.	
Alkali Red B, R	Mz.	
Alkali Violet, CA	PK.	
Alkali Violet R	By.	
Alkali Yellow, R	Bs.	
Alpine Blue		WGS
Alsace Brown B, BB, MR, LL, R	At	CD
Alsace Gray	Fi.	
Alsace Green, J	FTM.	
Amaranth	Mz, Math	SS
Amaranth B	Math	WGS, SS
Amaranth E, O	Mz	WGS, SS
Amaranth extra	SS.	
Amine Black 4B, S4B, 6B, 10B	A	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Amido Acid Black B, 4B, 6B, BL, BLG	A	WGS
Amidoazol Cutch	H	CD
Amidoazol Drab	H	CD
Amidoazol Gray	H	CD
Amidoazol Green B	H	CD
Amido Black 10B	Mz	WS
Amido Fast Black	Mz	Printing
Amido Fast Brown	Mz	Printing
Amido Naphthol Black 4Bex, 6B, S, R	Mz	WGS
Amido Naphthol Red 2B, 6B, G	Mz	WGS
Aminogene Blue R		
Aminogene Violet R		
Anil Blue R	K.	
Aniline Brown	Fi.	
Aniline Green	Math	WGS, CT
Aniline Orange	Math	CT
Aniline Yellow	Bt	WGS, SS, CT
Aniline Yellow extra	Klp.	
Aniline Yellow NT	Math	CD
Anisoline	Math	CD
Anisol Red	Mo	WGS, SS, CD
Anthra Alizarine Bordeaux	At	WACh
Anthra Alizarine Carmoisine	At	WACh
Anthra Alizarine Green CG	At	WACh
Anthra Alizarine Red B	At	WACh
Anthra Alizarine Yellow G	At	WACh
Anthracene Acid Black C	Klp	WCh
Anthracene Acid Black LW, SF, ST, SW	Math	WGSCh
Anthracene Acid Blue 2G, 2R	C	WGSCh
Anthracene Acid Brown B, G, N, R, SW pat, V	Math	WGS, WCh, SA
Anthracene Black		

Name of Dye.	Agent or Maker.	Dye Method.
Anthracene Blue C	Math	WCh
Anthracene Blue S, SWX, WB, WG, WR, SWGG extra	PK	WCh
Antharcene Blue Black C	Math	WGSCh
Anthracene Brown paste	Ba, Co, By	WCh
Anthracene Brown G paste, R paste	By	WCh
Anthracene Brown O paste	Mz	WCh
Anthracene Brown RR	Bs	CDv
Anthracene Chrome Black, F, 5B, FE, PFB ext.	Math	WGSCh
Anthracene Chrome Blue BB, F, G, FR	Math	WGSCh
Anthracene Chrome Blue D, RB	D	WACh
Anthracene Chrome Brown, D SWN	Math	WCh
Anthracene Chrome Green	Math	WCh
Anthracene Chrome Red, A	Math	WCh
Anthracene Chrome Violet, B R	Math	WCh
Anthracene Croceine B, G	F	WCh
Anthracene Dark Blue	PK	WCh
Anthracene Green, or Coeruleine		WCh
Anthracene Red	By, I, Klp	WGS
Anthracene Red B	HS	WGS
Anthracene Scarlet OR	HS	WGS
Anthracene Yellow paste	By	WCh
Anthracene Yellow BN, C, GG, R	Math	WGS, WCh
Anthracene Yellow GN	Bs	WCh
Anthracite Black BR	Math	WGS
Anthracyanine BL, DL, FL, 3FL	By	WGS, WCh
Anthracyl Chrome Brown D	D	WACh
Anthracyl Chrome Gray	D	WACh
Anthracyl Chrome Green A, D	D	WACh
Anthracyl Chrome Olive	D	WACh
Anthragallol, or Anthracene Brown	Math	WCh
Anthramine Yellow	At	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Anthraquinone Blue SR	PK	WGSCh
Anthraquinone Green G, Gex	B	WGS, WGSCh
Anthraquinone Violet	PK	WGS
Anthrol Blue NR paste	Mz	WCh
Apollo Red	Kell	WGS
Arabian Black	Bai	CD
Archil Red 3 VN	P	WGS
Archil Substitute N powder	Math	WGS
Archil Substitute G powder	Mz	WGS
Archil Extract, 1, 2, 3, 4	Math	WGS
Archil Extract extra and conc	Mz	WGS
Arnica Yellow	Kell	CD
Atlanta Yellow 103	HS	CD
Atlas Orange	BrS	WGS, SS
Atlas Red	BrS	WGS, SS
Atlas Scarlet	By	WGS
Auracine G	By	CT
Auramine G	G, Klp, PK	WG, CT
Auramine O, 1 II, conc	G. Klp, Mz, PK,	WG, CT
Aurantia	A	SS
Aureoline	Klp	CD
Aureosine		
Aurine	Gr, Lo, LP, Mo, RD.	
Auronal Black, NG, NV	tM	Sulphur
Auronal Brown GG	tM	Sulphur
Aurophenine	Mz	CD
Aurophosphine G	A	SA
Aurotine	ClCo.	
Autogene Black	SS	Sulphur
Autogene Brown BG	SS	Sulphur
Autogene Gray	SS	Sulphur
Azaleine		
Azarin R, S	Mz	Lakes

Name of Dye.	Agent or Maker.	Dye Method.
Azin Blue, alcohol soluble	Bs.	
Azindon Blue G, R	Mz	CT
Azin Green GO, BO, TO	Mz	WGS, CT
Azin Scarlet G conc. GO	Mz	WG, SA, CT
Azo Acid Black B, BL, G, GL, 3BL, R, TL, extra conc., TL, No. 2 extra SS, SS conc.	Mz	WGS
Azo Acid Blue B, 3 B conc., 3 BO	Mz	WGS
Azo Acid Brown	By	WGS
Azo Acid Carmine B	Mz	WGS
Azo Acid Fuchsine B, G	Mz	WGS
Azo Acid Magenta B, G, B conc., G conc.	Mz	WGS
Azo Acid Red B, BA, 5B	Mz	WGS
Azo Acid Ruby, 2B	Bs	WGS
Azo Acid Violet AL, A2B	By	WGS
Azo Acid Violet 4R R extra	By	WGS
Azo Acid Yellow	A, NYB	WGS
Azo Alizarine Black	DH	WCh
Azo Alizarine Bordeaux	DH	WCh
Azo Alizarine Yellow CG	DH	Printing
Azo Archil R	A	WGS
Azo Benzol Fast Crimson	B	WGS
Azo Black O	Mz	WGS, SS
Azo Black Blue	O	CD
Azo Blue	Mz, By, A	CD
Azo Bordeaux	Sch, By, O	WGS
Azo Brown N	Bs, Math	WGS
Azo Brown O	Mz	WGS
Azo Brown V	Mz	WGS
Azo Brown Y	P	WGS
Azo Carmine G paste, B	PK	WGS
Azo Carmine G	A	WGS
Azo Cardinal G	A	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Azo Chrome Blue T, TB	C	WGSCh
Azo Chromine	Kell	WGS
Azo Coccine 7B, or Cloth Red	A	WGS
Azo Coccine G, or Tropaeoline 0000		WGS
Azo Coccine 2R	A	WGS
Azo Cochineal	By	WGS
Azo Coralline	Bs	WGS
Azo Corinth	O.	
Azo Crimson L, S	By	WGS
Azo Dark Blue	O	CD
Azo Eosine	By	WGS
Azo Flavine	Bs, PK	WGS, SS
Azophone Black	At	CD
Azophone Green B, G	At	CD
Azo Fuchsine B, G, GN, S	By	WGS
Azo Galleine	Kell	WCh
Azo Green	By	WCh
Azo Grenadine S	By	WGS
Azo Mauve B, R	O	CD
Azo Merino Black B, 6B	C	WGS
Azo Merino Blue 3B, G	Math	WGS
Azo Merino Dark Blue R	Math	WGS
Azo Navy Blue B, 3B	Math	WGS
Azomine Black	UI	CD
Azomine Yellow	UI	CD
Azo Orange R	Klp	CD
Azo Orseille BB	Math	WGS
Azo Orseille R	A.	
Azo Orseilline	A, By, O, PK.	
Azo Patent Black 3BK, 4BK, 3BKN, TK	K	WGS
Azophenine Blue R	Grie	CT
Azophloxine 2G	By	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Azophor Black S, DP	Mz	Printing
Azophor Blue D	Mz	Printing
Azophor Orange MN	Mz	Printing
Azophor Orange	Mz	Printing
Azophor Pink A, Base	Mz	Printing
Azophor Red PN	Mz	Printing
Azo Pink BB	Mz	Printing
Azo Red B, BB, G	Bs	WGS
Azo Rubine	O, Sch	WGS
Azo Rubine	O	WGS
Azo Rubine A	Math	WGS
Azo Rubine SG	A	WGS
Azo Ruby	tM, Lev	WGS
Azo Ruby S, 2S	A	WGS
Azo Saffranine	Kell	WGS
Azo Turkey Red	O.	
Azo Violet	Mz, A, By, Lev	CD
Azo Wool Blue B, SE	Math	WGS
Azo Wool Violet 4B, 7R	Math	WGS
Azo Yellow	Bt, K, Mz, Klp, O, SS	WGS, SS
Azo Yellow conc.	Mz	WGS
Azo Yellow M	Klp	WGS, SS
Azo Yellow N, NR	Kell	SS
Azo Yellow OR	Mz	WGS, SS
Basel Blue, BB, R paste, S	Klp	WG, CT
Bavarian Blue alcohol soluble	A.	
Bavarian Blue DBF, DSF	A	SA, CT
Belgium Blue	AC.	
Bengal Blue	K.	
Bengal Deep Black D, 2B	SS	CDv
Bengal Pink	Klp	WGS
Benzaline Blue B	K	CT

Name of Dye.	Agent or Maker.	Dye Method.
Benzal Green, O powder, OO crystals	O	WN, CT
Beuzindamine	NI.	
Benzo Azurine G, 3G	Mz, A, By	CD
Benzo Azurine R, 3R	Mz, By	CD
Benzo Black	Mz, By	CD
Benzo Black Blue G, 5G, R	Mz, By	CD
Benzo Black Brown	By	CD
Benzo Blue BB, 3B, BX	By	CD
Benzo Bordeaux 6B	By	CD
Benzo Brown G, 5R, RC, NB, GG, MC	By	CD
Benzo Chrome Black B	By	CD
Benzo Chrome Black Blue, B	By	CD
Benzo Chrome Brown B, BS, 5G, R, 3R	By	CD
Benzo Copper Blue B, 2B	By	CD
Benzo Cyanine B, 3B, R	By	CD
Benzo Dark Brown	By	
Benzo Dark Green B, BB, GG	By	CD
Benzo Fast Black 3B, G	By	CD
Benzo Fast Blue B, Bn G, 5R	By	CD
Benzo Fast Gray	By	CD
Benzo Fast Orange S	By	CD
Benzo Fast Pink 2BL	By	CD
Benzo Fast Red L, GL, FC, 9BL	By	CD
Benzo Fast Scarlet 4BS, 8BS, 5BS	By	CD
Benzo Fast Violet R, N	By	CD
Benzo Fast Yellow 5GL	By	CD
Benzo Flavine O. No. 2	O	CT
Benzo Gray	By	CD
Benzo Green G, C	By	CD
Benzo Indigo Blue	By	CD
Benzoin Yellow	B	WCh
Benzo Nitrol Brown G, N, 2R	By	CD
Benzo Nitrol Bordeaux G	By	CDv

Name of Dye.	Agent or Maker.	Dye Method.
Benzo Olive extra	By	CD
Benzo Orange R	A, By	CD
Benzopurpurine B, 4B, 6B, 10B	Mz, By, A	CD
Benzopurpurine 4Bex conc.	Mz	CD
Benzopurpurine 4B double	Mz	CD
Benzo Red SG, 10B, 12B	By	CD
Benzo Rhodamine 3B	By	CD
Benzo Rhoduline Red B, 3B	By	CD
Benzo Sky Blue	Mz, By, A	CD
Benzo Violet RL extra	By	CD
Benzyl Acid Black BB	Klp	WGS
Benzyl Black B, 4B	Klp	WGS
Benzyl Blue S	Klp	WGS
Benzyl Bordeaux, B	Klp	WGS
Benzyl Blue S	Klp	WGS
Benzyl Green G, B	Klp	WGS
Benzyl Violet 4B, 10B, 5B, 5BN	Klp	WGS
Benzyl Violet, 4B	Bt, CR, RE, tM,	WGS, SS, CT
Berlin Blue A	A	WGS
Best Magenta Crystals	Bt.	
Best Violet, or Brilliant India Dye	Bt.	
Bichromine Blue AB, G	D	WCh
Biebrich Acid Black ST	K	WGS
Biebrich Acid Blue, G, GG	K	WGS
Biebrich Acid Red B, 4B, 3G, 5B	K	WGS
Biebrich Acid Violet 2B, 6B	K	WGS
Biebrich Alizarine Black 4BN	K	WGS
Biebrich Patent Black AN, 4AN, AO 4BN, RO, 4B, B	K	WGS
Biebrich Patent Jet Black, 3BO	K	WGS
Biebrich Scarlet	K	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Bismarck Brown	A, CR, F, K, Math, NI, Lh, O, PK,	CT
Bismarck Brown B	Klp	CT
Bismarck Brown EE	Math	CT
Bismarck Brown FFG	Math	CT
Bismarck Brown G	Klp	CT
Bismarck Brown GG	Math, O	CT
Bismarck Brown GOO, GOOO	O	CT
Bismarck Brown R, Y Rex	Mz	CT
Bismarck Brown ROO, ROOO	O	CT
Bismarck Brown T	Klp	CT
Bismarck Brown YS 8049	Math	CT
Bitter Almond Oil Green	Bt	WGS, SS, CT
Black Black O	Mz	WGS, SS
Black Blue O	Mz	WGS, SS
Black Soluble in Oil	Mz, Math.	
Blackley Blue	Lev	SS, CT
Blue Asozin	P	WGS
Blue Alcohol Soluble	Mz.	
Blue B, BB	Mz	Printing
Blue BJB	P	WGS
Blue Black B	PK	WGS
Blue Black GR, 5G	Klp	WGS
Blue Black, Diphenyl	Kell	CD
Blue BS	Math, P	WGS
Blue 3BS	P	WGS
Blue BW	O.	
Blue CB, alcohol and water soluble	Klp.	
Blue extra	RD	CT
Blue for Silk	Math.	
Blue for printing, paste and powder	Mz.	
Blue for white	Kell	SS
Blue G	Jy	CT

Name of Dye.	Agent or Maker.	Dye Method.
Blue, green shade	Mz	WGS, SS, CT
Blue Green S	PK.	
Blue R	Mz	Printing
Blue, red shade	Mz	WGS, SS, CT
Blue T conc.	Mz	WGS, SS
Blue 2111	At	CD
Blue Black 5534	H	WGS
Body Blue O	Mz	WGS, SS, CT
Bordeaux B	Mz, A, Math,	LPRF
Bordeaux BL	Math	WGS, SS
Bordeaux BX	By	WGS
Bordeaux COV	A	CD
Bordeaux DH	Klp	WGS
Bordeaux Diamine B, S	Math	CD
Bordeaux extra	By	WGS
Bordeaux G	Bs, By	WGS
Bordeaux R extra	Mz	WGS
Bordeaux S	A, RF	WGS
Bottle Green	Bch.	
Brahma Orange	Z.	
Brahma Red B, BB, 6B	Z.	
Braxeline	At.	
Bright Blue extra	Mz	CD
Bright Blue O	BL	CD
Bright Yellow T	Mz, PK	CD
Brilliant Acid Carmine 6B	O	WGS
Brilliant Acid Green 6B	By	WGS
Brilliant Alizarine RR, 5R	By	CD
Brilliant Alizarine Blue D, G, R, 3R powder	By	WCh
Brilliant Alizarine Blue EM	Mz	WCh
Brilliant Alizarine Bordeaux R	By	WCh
Brilliant Alizarine Cyanine G, 3G	By	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Alizarine Viridine F	By	WCh
Brilliant Anthrazol	B	WGS
Brilliant Azurine B, R	A, By	CD
Brilliant Azurine 5G	Mz, A, By	CD
Brilliant Benzo Green B	By	CD
Brilliant Black B	PK	WGS
Brilliant Black Solution BE, NE, RE	Math.	
Brilliant Blue	Bs.	
Brilliant Blue 7B	O.	
Brilliant Blue HB	Gt	WGS
Brilliant Bordeaux S	A	WGS
Brilliant Carmine	NYB	SS
Brilliant Carmine Green	Lev	WGS
Brilliant Carmoisine O	A	WGS
Brilliant Cochineal 2R, 4R	Math	WG
Brilliant Chrome Red, paste	By.	
Brilliant Cloth Blue Bex, G	K	WAS
Brilliant Congo G, R	Mz, A, By	CD
Brilliant Cotton Blue B57	Sch	CAl
Brilliant Cotton Blue, greenish	By	CT
Brilliant Cresyl Blue 2B	L	CT
Brilliant Crimson B, O, N	Mz	WGS, CT
Brilliant Crocein blue, and yellow	Mz	WGS, SS, CAl
Brilliant Croceine AZ	Math	WGS
Brilliant Crocein B, BB	Mz	WGS, SS
Brilliant Croceine 3B	Mz, By, Math	WGS, SS
Brilliant Croceine BOO	Math	WGS
Brilliant Croceine 5B	Mz, Math	WGS, SS
Brilliant Croceine 6B, 7B, 9B, 10B	Math	WGS
Brilliant Croceine D	Mz	WGS
Brilliant Croceine M, MOO	Math	WGS
Brilliant Croceine MOO	NYB	SS
Brilliant Croceine R	Mz, Math	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Croceine ROO	Math	WGS
Brilliant Croceine Scarlet D	Mz	WGS
Brilliant Cyanine Blue R	By	WCh
Brilliant Dianil Red R, R Conc.	Mz	CD
Brilliant Diazine Blue B, B	K.	
Brilliant Direct Navy Blue B	Bs	CD
Brilliant Direct Red 249	Sch	CD
Brilliant Fast Red P	By	Paper
Brilliant Firn Blue	Klp	CT
Brilliant Geranine B, 3B	By	CD
Brilliant Green	Mz, By, CJ, CR, F, K, Klp, Math, PK, NI, O, PS, RE, tM, Bt,	WN, SS, CT
Brilliant Green crystals, B, C	Mz	WN, CT
Brilliant Green crystals extra, extra N, powder superior, ia, No. 12	Mz	WN, SA, CT
Brilliant Green O crystals	O	WN, CT
Brilliant Indigo Carmine sub	Lev	WGS
Brilliant Lake Red R	Mz	Lakes
Brilliant Lake Scarlet G, R, 2 R	Mz	WGS, SS
Brilliant Milling Blue B	C	WGSCh
Brilliant Milling Green B	C	WGS
Brilliant Milling Scarlet 2 B	Lev	WGS
Brilliant Naphthol Blue B, R	C	WGS
Brilliant Opaline	Gb.	
Brilliant Orange G	Mz, A	WGS, SS
Brilliant Orange O, R	Mz	WGS, SS
Brilliant Orcelleine, pat	Math	WGS
Brilliant Orseille C	Math	WGS
Brilliant Ponceau G, GG	Math	WGS
Brilliant Ponceau 4R	By	WGS
Brilliant Ponceau 5R	Bs, By, Math	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Brilliant Purpurine 10B	A	CD
Brilliant Purpurine R	Mz, A, By	CD
Brilliant Purpurine 4R	RF	CD
Brilliant Purpurine 5B	RF	CD
Brilliant Red	Sch	WGS
Brilliant Red D	Klp	WGS
Brilliant Red Congo G	Mz, A, By	CT
Brilliant Rhoduline Violet R	By	CT
Brilliant Rubine O	Mz	WGS, SS
Brilliant Safranine G	A	WGS, CT
Brilliant Scarlet	Lev.	
Brilliant Scarlet G, GG, R, RR, 3R, 4R, 6R, T	Math	WGS
Brilliant Scarletine	H	WGS
Brilliant Scarlet N3R	SS	WGS
Brilliant Sky Blue G	Bs	CD
Brilliant Sky Blue G, 5G	By	CD
Brilliant Sulphon Azurine R	By	
Brilliant Sulphon Red B	By	WGA
Brilliant Wool Blue B extra, G extra	By	SS, WGS
Brilliant Yellow	Mz, A, By, SB, SCH, tM	WGS, SS
Brilliant Yellow I	H	WGS
Brilliant Yellow S	PK	WGS, SS
Bromofluoresceic Acid Crystals	Mz	Lakes
Bromofluoresceic Acid AG, A3G, A6G	Mz	Lakes
Bromofluoresceic Acid AL	Mz	Lakes
Bromofluoresceic Acid BA, conc.	Mz	Lakes
Bromofluoresceic Acid BL Blue	Mz	Lakes
Bromofluoresceic Acid BL Yellow	Mz	Lakes
Bronze Blue J	PK	
Bronze Diamine G	Math	CD
Brown BBX	BrS	CD

Name of Dye.	Agent or Maker.	Dye Method.
Brown JE, JEEE	P	WGS
Brown M	P	WGS
Brown N	P	WGS
Brown SDM, SDP	SS	CD
Brown for Leather O	Mz	Tannin
Buffalo Black 4B, 8B	Sch	WGS
Buffalo Brown R	Sch	CT
Buffalo Bordeaux	Sch	CD
Buffalo Chrome Black	Sch	WGSCh
Buffalo Crimson B	Sch	CD
Buffalo Rubine	Sch	CD
Buffalo Scarlet 4B	Sch	CD
Buffalo Thiol Black GB	Sch	Sulphur
Buffalo Violet 4R	Sch	CD
Butter Yellow	HM	
Cachou de Laval S	P	Sulphur
Cachou Diamine	Math	CD
Calcutta Black 3B, 3G	H.	
Calico Yellow, GG, 3G, 4G	Kell	Printing
Campanuline	A	CD
Canarine	Klp.	
Capri Blue GN	Mz, Bs	CT
Capri Green B, G, GG	Mz	CT
Carbazol Yellow W	PK	CD
Carbide Black, BO, R, RO, E, ER Rex, S, SE, SO	Klp	CD
Carbon Black B, BD, BW, 4B, GAT	Mz	WGS
Carbon Black BW	K	CD
Cardinal	Mz	WG, SA, CT
Carminogen BB	Mz	Lakes
Carmoisine	A, By, PK, SS	WGS
Carmoisine conc.	A, K, SS	WGS
Carnotine	ClCo	CD

Name of Dye.	Agent or Maker.	Dye Method.
Caroubier	Klp.	
Cashmere Black B, 6B, T	By	WGS
Cashmere Blue TG	By	WGS
Cashmere Brown V	By	WGS
Cashmere Green B	By	WGS
Cerasine	Klp.	
Cerasine Blue LC	Math.	
Cerasine Orange G	Math.	
Cerasine Red, A	Math.	
Cerasine Yellow, G T	Math.	
Cerise	Mz, Bt, Klp. Math, NI, PK, PS. SS.	WG, SA. CT
Cerotine Orange C, extra	O	WGS
Chestnut Brown	A	CD
Chicago Blue B, 4B, 6B, R, 2R, 4R, RW	A	CD
Chicago Gray	Kell	CD
Chicago Orange, G, extra, 3G	Kell	CD
China Blue	Mz, A, BrS, By, PN,	WGS, SS. CT
China Blue R, No. 1, 2	Math.	
China Blue 71115	KB.	
China Green crystals	Kell.	
Chinoline Blue	PK.	
Chinoline Green	A.	
Chinoline Red	A.	
Chinoline Yellow	Mz, BrS, By, PK,	WGS
Chloramine Blue 6B	S	CD
Chloramine Brown C, G	By	CD
Chloramine Orange G	By	CD
Chloramine Red 8BS	By	CD
Chloramine Violet	By	CD
Chloramine Yellow GG, C, FF, Wex	By	CD

Name of Dye.	Agent or Maker.	Dye Method.
Chloranisidine	B	Lakes
Chlorantine Blue 2B	Klp	CD
Chlorantine Lilac	Klp, PK	CD
Chlorantine Red 8B	Klp	CD
Chlorantine Violet B, R	Klp	CD
Chlorazol Blue 6G, R, 2R, 6B	H	CD
Chlorazol Brilliant Blue 8SB, 10B, 12B, R	H	CD
Chlorazol Brilliant Green B, G	H	CD
Chlorazol Brown A, B, C, R, M	H	CD
Chlorazol Fast Yellow A	H	CD
Chlorazol Green B, Y	H	CD
Chlorazol Heliotrope	H	CD
Chlorazol Yellow G, 3G, Y	H	CD
Chlorine Blue R	Klp	CT
Chlorine Blue T	Mz	Special
Chlorophenine G, O, R, Y	ClCo	CD
Chlorophenine Orange, AA, R	ClCo	CD
Chromal Blue G conc		
Chromanil Black RF, BF, 2BF, 3BF	A	CD
Chromanil Brown GG, R, 2G	A	CD
Chromate Black 6B, TB4B	A	WGSCh
Chromazine Violet	Sch	WCh
Chromazo Maroon	Sch	WCh
Chromazo Red RB	Sch	WCh
Chromazo Yellow GR	Sch	WCh
Chromazon Blue B, R	Kell	WGS
Chromazon Red	Kell	WGS
Chrome Azurine S	S	WCh
Chrome Black	Jy, SW	WGS
Chrome Black, B, T	Mz	WGSCh
Chrome Blue	Jy, By, Math	WCh
Chrome Blue B	Mz	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Chrome Blue 2B, 4B, BN, PE, R, 2R, 3R, No. 470	Kell	WCh
Chrome Blue F	C	Printing
Chrome Bordeaux	By	WCh
Chrome Brown G	Kell	WCh
Chrome Brown BO, RO	Mz	WCh
Chrome Cyanine G, T	By	WACh
Chrome Fast Black B, F	A	WCh
Chrome Fast Black F, P, PWWR	Klp	WGSCh
Chrome Fast Blue B	Klp	WGSCh
Chrome Fast Blue B, 4B	A	WGSCh
Chrome Fast Blue FR	C	Printing
Chrome Fast Brown A, BC, G, R	Klp	WGSCh
Chrome Fast Cyanine B	Klp	WGSCh
Chrome Fast Green G	Klp	WGSCh
Chrome Fast Red B, GR	A	WGSCh
Chrome Fast Yellow G, 2G, R	A	WCh
Chrome Green	By	WCh
Chrome Leather Black B C	Math.	
Chrome Orange	By	WCh
Chrome Patent Black TB, TG, TR, T	K	WGSCh
Chrome Patent Green A, N	K	WGSCh
Chrome Prune	By	WCh
Chrome Red R	HS	WCh
Chrome Red paste	By	WCh
Chrome Ruby paste	By	WCh
Chrome Violet powder	By, Kell	WCh
Chrome Violet paste	By	WCh
Chrome Violet M	C	Printing
Chrome Yellow	H S, N I	WCh
Chrome Yellow D	By	WCh
Chrome Yellow G	By, HS	WCh
Chrome Yellow P	Kell	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Chrome Yellow R	SS	WACh
Chromindigene	Mz	Printing
Chromine G	K	WCh
Chromine Blue B, T	HS	WCh
Chromium Patent Black DG, DGG	K	WGSCh
Chromocyanine	DH	Printing
Chromoglaucine V M paste	Mz	Printing
Chromogen I	Mz	WGSCh
Chromotrop 2B, 6B, 8B, 10B, 2R	Mz	WGS
Chromotrop DW, FB, S, SB, SN, SR, F4B	Mz	WGSCh
Chromotrop Blue A, WB, WG	Mz	WGSCh
Chrysamine	By	CD
Chrysamine G	Mz, A, By	CD
Chrysamine GG	By	CD
Chrysamine R	Mz, A, By	CD
Chrysaniline		
Chrysoidine	Mz, A, By, K, PK, Lh, WN, SA, CT	
Chrysoidine AG, FF	Math	WN, SA, CT
Chrysoidine G	Kell, Klp,	WN, SA, CT
Chrysoidine R	Mz Kell, Klp, Math,	WN, SA, CT
Chrysoidine Y, YY	Mz, Sch, Math,	WN, SA, CT
Chrysoidine Brown	Math	WN, SA, CT
Chrysoine	Klp, Mz, PK, SS, tM	
Chrysoline	Kell	WGS
Chrysophenine R	Mz, A, By	CD
Chrysophenine conc., ext. conc.	Mz	CD
Chrysophenine G	Mz	CD
Ciba Blue B, 2B	I	Vat
Cinereine	SS.	

Name of Dye.	Agent or Maker.	Dye Method.
Cinnabar Scarlet	BK.	
Cinnamine S	W.	
Cinnamon Brown	PS	WGS, CT
Citronine	Mz, BrS, Fi, Klp, O, SS	WGS, SS
Citronine A	Mz	WGS, SS
Citronine AA, 2A, extra, AHE NE	SS	SA
Citronine G, GOO, GOOO	O.	
Citronine NE	SS	SA
Citronine Diphenyl G	Kell	CD
Citronine Diphenyl GOO	O	SS
Claret Red	Sch	WGS
Claret Red B, 3B, G, GR, R, B extra O, S	Mz	WGS
Claret Red for Lake B	Mz	Lakes
Clayton Aurotine	ClCo.	
Clayton Carnotine	ClCo	WGS
Clayton Cloth Red	ClCo	WGS
Clayton Fast Gray D	ClCo	Sulphur
Clayton Fast Black	ClCo	Sulphur
Clayton Red	ClCo.	
Clayton Yellow, G	ClCo	CD
Clematine	Kell	CT
Cloth Blue O	Mz	WGS, SS, CT
Cloth Blue S	L	WGS
Cloth Brown reddish, yellowish	Mz, By	WCh
Cloth Orange	Mz, By	WCh
Cloth Red	Mz	WCh
Cloth Red, see Stanley Red	ClCo.	
Cloth Red B	Mz, Bs, By, O	WCh
Cloth Red BA	A	WCh
Cloth Red 3B extra	By	WCh
Cloth Red BO, FRBO	O	WCh

Name of Dye.	Agent or Maker.	Dye Method.
Cloth Red G	Mz, By, O	WCh
Cloth Red G extra, 3G extra	By	WCh
Cloth Red GA, 3GA	A	WCh
Cloth Red GO, 3GO	O	WCh
Cloth Red O	Mz	WCh
Cloth Red OB	O	WCh
Cloth Red R	Bs	WCh
Cloth Scarlet G, R	K	WGS
Cloth Yellow G, R	O	WGSCh
Coccein 3B	SS	WGS
Coccine 2B	A	WGS
Coccinin, B	Mz	WGS
Cochineal Red A	PK	WGS
Cochineal Scarlet G	Sch	WGS
Cochineal Scarlet PS	By	WGS
Cochineal Scarlet 2R, 4R	Sch	WGS
Cochineal Substitute	Klp	WGS
Coelestine Blue B	By	CT
Coeruleine A, B, S BWR	Mz	WCh
Coeruleine S powder or paste	Mz, By, Klp, PK	WCh
Coeruleine SW, powder or paste	Mz, By	WCh
Cold Black, BR	A	CD
Columbia Black B, BB, FB, R, FF	A	CD
Columbia Black FF extra, FB strong, F2B, 2BX, 2BW, EA extra, WA extra	A	CD
Columbia Black Blue G	A	CD
Columbia Black Green D	A	CD
Columbia Blue G, R	A	CD
Columbia Bordeaux B	A	CD
Columbia Brown R, M	A	CD
Columbia Chrome Black BB	A	CD
Columbia Fast Black V extra	A	CD
Columbia Fast Blue 2G	A	CD

Name of Dye.	Agent or Maker.	Dye Method.
Columbia Fast Red F	A	CD
Columbia Fast Scarlet 4B	A	CD
Columbia Green	A	CD
Columbia Orange R	A	CD
Columbia Red 8B, 6B, 4B, 2B	A	CD
Columbia Violet R	A	CD
Columbia Yellow	A	CD
Concentrated Cotton Blue R, 2R, 1, 2, 3, 4, B	Mz	WGS, SS, CAl
Congo	Mz, A, By	WN, CD
Congo B	SS.	
Congo BB	A, By	CD
Congo G R	A, By	CD
Congo Blue BX, R, 2B, 3B, 2BX	A	CD
Congo Brown G, R	A	CD
Congo Corinth B, G	A, By	CD
Congo Fast Blue B, R	A	CD
Congo GR	A, By	CD
Congo Orange G	A	CD
Congo Orange R	Mz, A, By	CD
Congo P, Pure Blue	A	CD
Congo 4 R	Mz, A, By	CD
Congo Red	Mz, Sch, Klp, By, A	CD
Congo Rubine	Mz, A	CD
Congo Violet	A	CD
Congress Red FEN	NI	CD
Coomassie Black B	Lev	CWD
Coomassie Blue	Lev	CWD
Coomassie Violet	NS	WGS
Coomassie Wool Black BA, conc., R, S	Lev	WGS
Copper Black S	Mz	WGS, Dev
Copper Blue B, B extra	Mz	WGS, Dev
Copper Red		WGS, Dev

Name of Dye.	Agent or Maker.	Dye Method.
Coralline	LP.	
Coreine, AB, AR, RI	Klp	WCh
Corvan Black	B	WGSCh
Cotton Black B, 3B	PK	CD
Cotton Blue	Mz, Bs	CAl
Cotton Blue BI	HS	WGS, CAl
Cotton Blue 3B, 6B extra	Mz, O	WGS, SS, CT
Cotton Blue O	Kell.	
Cotton Blue OO extra	O	CT
Cotton Blue R	PK, SS	CT
Cotton Bordeaux	PK	CD
Cotton Brown	PK	CD
Cotton Brown 3G, R	ClCo	CD
Cotton Brown N	Math	CD
Cotton Brown R, G	PK	CD
Cotton Dark Brown B	AC	CD
Cotton Green CG	A	CD
Cotton Navy Blue CR	AC	CD
Cotton Orange G, R	PK	CD,
Cotton Ponceau	BK.	
Cotton Red, 4B	PK	CD
Cotton Rhodanine	BCF	CT
Cotton Scarlet	PK	CAl
Cotton Scarlet 3B	Sch, K	CAl
Cotton Scarlet O	Mz	WN, SA, CT
Cotton Scarlet, yellowish	Math	SA, CT
Cotton Yellow G, R	Kell	CD
Cotton Yellow G, GB, R	PK	CD
Cresotine Yellow G, R	Mz, A, By, O	CD
Cresyl Blue BB, 6B, BBSO, RR	Bs	CT
Cresyl Fast Violet B, BB	Bs	CT
Cresyl Green GG	Bs	CT
Cresyl Violet BB	Bs	CT

Name of Dye.	Agent or Maker.	Dye Method.
Criterion Blue G	At	WGS
Croceine AZ, X	Math.	
Croceine B, 3B	Sch	WGS, SS
Croceine 3BX	By, K	WGS
Croceine Orange	By, K	WGS
Croceine Scarlet 3B	Sch, By, K	WGS, CD
Croceine Scarlet 4BX	K	WGS
Croceine Scarlet 7B	By	WGS
Croceine Scarlet 8B	By, K	WGS
Croceine Scarlet 10B	By	WGS
Croceine Scarlet O extra	K	WGS
Cross Dye Black B, 4B, 6B	H	CD
Cross Dye Black RT	H	Sulphur
Cross Dye Drab	H	Sulphur
Cross Dye Yellow	H	Sulphur
Crow Black	Mz, PK	CD
Crumpsall Direct Fast Brown B, M O	Lev	CD
Crumpsall Fast Yellow YYFD	Lev	CD
Crumpsall Yellow	Lev	WGS
Crystal Ponceau	A, PK	WGS
Crystal Ponceau 6R	Mz, Math	WGS
Crystal Scarlet 6R	Mz, Math	WGS, SS
Crystal Violet 5B, 10B	Math.	
Crystal Violet 5BO	Klp	WN, SS, CT
Crystal Violet O	Mz, PK	WN, SA
Crystal Violet P	By	WN, SA
Cuba Black R	O	CD
Cumidine Ponceau	Mz, A, PK	WGS
Cumidine Red	Mz, A, PK	WGS
Cupranil Brown B, R C	Klp	CD
Curcumeine extra	A	WGS
Curcumine	O	WGS, SS
Curcumine S, S extra	Mz. A, By	CD

Name of Dye.	Agent or Maker.	Dye Method.
Curcumine Substitute	SS	WGS
Curophenine	ClCo	CD
Cutch Brown D	Mz, N	WG, SA, CT
Cutch Brown D	ClCo	CD, WGS
Cutch Brown G	Mz	WG, SA, CT
Cutch Brown GG	BrS	CD
Cutch Brown O, R, VY	ClCo	CD, WGS
Cyananthrene B double	B	Vat
Cyananthrol BGA, R, RA, RB, RBA, RGA	B	WGS
Cyanine B	Mz	WGS, SS
Cyanol extra, BB, FF, C	Math	WGS
Cyanol Fast Green G	Math	WGS
Cyanol Green B, CG, 6G	Math	WGS
Cyanosine	Klp.	
Cyanosine Alcohol Soluble	Mz.	
Cyklamine	Mo	WG, SA
Cyprus Blue R	A	WGS Copper
Cyprus Green B	A	WGS Copper
Dahlia		WGS, SS, CT
Dahlia for white	Kell	SS
Dark Blue	Mz, PK	WGS
Dark Brown	SW	CD
Dark Brown M, MB	Mz	WG, SA, CT
Dark Brown Salt G, R	Mz	Printing
Dark Green	PK	WGS
Dark Green 6S2	BrS	CD
Deep Wool Black 2B, 3B	A	WG
Delphine Blue B, B conc.	Mz, S	WCh
Delta Purpurine 5B	Mz, By	CD
Delta Purpurine 7B	Mz, A, By	CD
Delta Purpurine G	By	CD
Diamine Azo Black B, BB pat	Math	CD

Name of Dye.	Agent or Maker.	Dye Method.
Diamine Azo Blue 54, 55	Math	CD
Diamine Azo Blue R, RR, pat	Math	CD
Diamine Benzol Blue G, R	Math	CD
Diamine Black B, BH, BO, HW, RO, BX, RMW	Math	CD
Diamine Black Blue B	Math	CD
Diamine Black Green N	Math	CD
Diamine Blue B, 2B, 3B, BG, BX, C4B, 6G, C4R, LG, C2R, LR, NC, RW, 3R, SRX, 50, 52, 53, 55, AB, AZ	Math	CD
Diamine Blue Black E, 72592, R, RL	Math	CD
Diamine Bordeaux B, S	Math	CD
Diamine Brilliant Blue G	Math	CD
Diamine Brilliant Bordeaux R	Math	CD
Diamine Brilliant Scarlet S	Math	CD
Diamine Bronze B, C, SF	Math	CD
Diamine Brown B, GG, 3G, M, OO, QQ, V, 31, 32, 33, 34, 35, 36, 37	Math	CD
Diamine Catechine B, G, pat. 3G	Math	CD
Diamine Catechu	Math	CD
Diamine Cutch	Math	CD
Diamine Cyanine B, 3B, R	Math	CD
Diamine Dark Blue B, R	Math	CD
Diamine Dark Green	Math	CD
Diamine Deep Blue RB	Math	CD
Diamine Deep Dark Blue B, R	Math	CD
Diamine Fast Black L	Math	CD
Diamine Fast Blue C, FFB, FFG, G	Math	CD
Diamine Fast Brown G	Math	CD
Diamine Fast Red, F	Math	CD
Diamine Fast Scarlet BB, 4B, GB, GG, 4BX, 6BS, 8BX	Math	CD

Name of Dye.	Agent or Maker.	Dye Method.
Diamine Fast Yellow A, AR, B, FF, M, 3G	Math	CD
Diamine Gold	Math	CD
Diamine Gold Yellow	Math	CD
Diamine Gray G	Math	CD
Diamine Green B, G, CL	Math	CD
Diamine Heliotrope G	Math	CD
Diamine Milling Black B, FG extra	Math	CD
Diamine Jet Black CR, OO, 4D, RB, SE, SOOO, JEI	Math	CD
Diamine New Blue G, P, R	Math	CD
Diamine Nitrazol Black, B	Math	CD
Diamine Nitrazol Brown B, BD, T, G, RD	Math	CD
Diamine Orange D, DC, G, GC, R, B	Math	CD
Diamine Pure Blue, A, FF	Math	CD
Diamine Red B, 3B, 10B, D, No. 72732	Math	CD
Diamine Rose RD, B extra, BG, GD, GGN	Math	CD
Diamine Scarlet B	Math	CD
Diamine Scarlet 3B	HS, Math	CD
Diamine Sky Blue, FF	Math	CD
Diamine Steel Blue L	Math	CD
Diamine Violet N	Math	CD
Diamine Violet Red	Math	CD
Diamine WO	Math	CD
Diamine Yellow N, paste, R paste, CP	Math	CD
Diamineral Black B, 3B, 6B	Math	CD
Diamineral Blue R	Math	CD
Diamineral Brown G	Math	CD
Diaminogene B, BR, CF, extra	Math	CDv
Diaminogene Blue BB, G, RA, 2RA, NA, NB, 3RN	Math	CDv

Name of Dye.	Agent or Maker.	Dye Method.
Diaminogene Sky Blue	Math	CDv
Diamond Black F, NG, GA, FB, PV, PVB, P2B	By	WGSCh
Diamond Blue 4R	UI	WGS
Diamond Blue Black G, R, T	By	WGSCh
Diamond Bordeaux R	By	WACh
Diamond Brown R, 3R	By	WGSCh
Diamond Fast Acid Black	Me.	
Diamond Fast Blue, Red Yellow	Me.	
Diamond Flavine G	By	WCh
Diamond Green 3G	By	WACh
Diamond Green SS	Mo, By	WGSCh
Diamond Green B, G	PK.	
Diamond Green crystals	KB.	
Diamond Orange paste	By.	
Diamond Phosphine D, GG PG, R	Math	CT
Diamond Yellow paste G, R	By	WCh
Dianil Black AC	Mz	CDv
Dianil Black CB, CR	Mz	CDv
Dianil Black E, ES	Mz	CDv
Dianil Black G	Mz	CDv
Dianil Black HW	Mz	CD
Dianil Black N	Mz	CD
Dianil Black PG, PR	Mz	CDv
Dianil Black R	Mz	CDv
Dianil Black RN	Mz	CD
Dianil Black T	Mz	CDv
Dianil Blue B, BX, 2BM, 3BM	Mz	CD
Dianil Blue E, ET, EG	Mz	CD
Dianil Blue G	Mz	CD
Dianil Blue HG, H2G, H3G, H6G	Mz	CD
Dianil Blue R, 2R, 3R, 4R, 2RS	Mz	CD
Dianil Blue 2RM, 3RM	Mz	CD

Name of Dye.	Agent or Maker.	Dye Method.
Dianil Brilliant Black B, G, 2G, R, 2R	Mz	CD
Dianil Brilliant Yellow S	Mz	CD
Dianil Brown B, BD, BH	Mz	CD
Dianil Brown D	Mz	CD
Dianil Brown G, 2G, 3GO, 3GI, 3GA	Mz	CD
Dianil Brown M, MH	Mz	CD
Dianil Brown R, 3R	Mz	CD
Dianil Brown X	Mz	CD
Dianil Chrome Brown G, R	Mz	CD
Dianil Claret B, G	Mz	CD
Dianil Crimson B, G	Mz	CD
Dianil Dark Blue R, 3R	Mz	CD
Dianil Dark Green B, X. X conc	Mz	CD
Dianil Deep Black, B conc., FF conc., TV conc., BR extra conc.	Mz	CD
Dianil Direct Yellow S	Mz	CD
Dianil Fast Red F	Mz	CD
Dianil Fast Scarlet SBS	Mz	CD
Dianil Green G, B, BX, BBX, GX	Mz	CD
Dianil Indigo O	Mz	CD
Dianil Japonine G	Mz	CD
Dianil Orange F, G, O, BM	Mz	CD
Dianil Pink BD	Mz	CD
Dianil Red 4B, 6B	Mz	CD
Dianil Scarlet G, 2R	Mz	CD
Dianil Violet H	Mz	CD
Dianil Yellow G, 3G, R, OO, MB	Mz	CD
Dianisidine Blue	By, Mz	Printing
Dianol Black Brown	Lev	CD
Dianol Blue G, BH	Lev	CD
Dianol Brilliant Red extra	Lev	CD
Dianol Brown NB, R, Y, YY	Lev	CD
Dianol Green G	Lev	CD

Name of Dye.	Agent or Maker.	Dye Method.
Dianol Olive	Lev	CD
Dianol Orange Brown, ABZ	Lev	CD
Dianol Violet 2B, R	Lev	CD
Dianthine, B, G	Lev	CD
Dianthine Pink	BrS	CD
Diazethyl Black B, R	By	CD
Diazine Black BRS	Kell	CD
Diazine Blue B, 2B, R	K	CT
Diazine Brown	K	CT
Diazine Green	K	CT
Diazo Black	K	CT
Diazo Black 2B, BHN, 3B, G, R	By	CD
Diazo Blue B	By	CDv
Diazo Blue Black RS	By	CDv
Diazo Bordeaux, 7B	By	CDv
Diazo Brilliant Black B, R	By	CDv
Diazo Brilliant Orange G	By	CDv
Diazo Brilliant Scarlet Bex, 3Bex, 6Bex, Gex, 2BL extra, conc, 5BL extra	By	CDv
Diazo Brown G	By	CDv
Diazo Brown R extra, V	By	CDv
Diazo Deep Blue BB, 3B	By	CDv
Diazo Fast Black	Bal	WGS
Diazo Fast Black BHX, 3B, G	By	CD
Diazo Fast Black SD	By	CDv
Diazo Indigo Blue B, M, BR, extra, 3R, 2RL, 4RL	By	CDv
Diazo Marine Blue B, G	O	CDv
Diazo Navy Blue 3B	By	CDv
Diazo Rubine R	By	CDv
Diazo Violet R	By	CDv
Diazogene B, BB, 3B	By	CDv
Diazurine B, G	Kell	CDv

Name of Dye.	Agent or Maker.	Dye Method.
Diazyl Black	Bs	CD
Diazyl Brown G, T	Bs	CD
Dimethyl Orange	Bs	CD
Dingley Blue B, 2R	Sch	CD
Dingley Yellow 17	Sch	CD
Dioxine	L	WCh
Diphene Blue B Base, R Base	A	CD
Diphenylamine Blue	Mz.	
Diphenylamine Orange	Klp.	
Diphenyl Black B, DBB, ERF, 3G, R, RR	Kell	CD
Diphenyl Blue B, 2B, BM, DBB, EFR, EFS, 3G, NT, RR	Kell	CD
Diphenyl Blue Black	Kell	CD
Diphenyl Brown B, BY, CB, CG, CGG, R, RR, Y, 3G	Kell	CD
Diphenyl Chrysoine RR, 3G	Kell	CD
Diphenyl Catechine G, R, B	Kell	CD
Diphenyl Citronine G	Kell	CD
Diphenyl Dark Blue R	Kell	CD
Diphenyl Fast Black	Kell	CD
Diphenyl Fast Brown G, GN	Kell	CD
Diphenyl Fast Black	Kell	CD
Diphenyl Fast Yellow G, GG	Kell	CD
Diphenyl Gray	Kell	CD
Diphenyl Green G, GB, 3G, KOG	Kell	CD
Diphenyl Indigo Blue	Kell	CD
Diphenyl Orange GG, RR, ORW	Kell	CD
Diphenyl Phosphine G, conc.	Kell	CD
Diphenyl Red 8B	Kell	CD
Diphenyl Violet R, BC, BV	Kell	CD
Diphenyl Yellow, R, GG, 3G	Kell	CD
Direct Black B	SS	CD

Name of Dye.	Agent or Maker.	Dye Method.
Direct Black BFG	A	CD
Direct Black GBN, K, G	Klp	CD
Direct Black R	SS	CD
Direct Black X	Bs	CD
Direct Black BK	Klp	CD
Direct Black DR, X	Bs	CD
Direct Black No. 8	A C	CD
Direct Black No. 5062	At	CD, CDv
Direct Blue B	Mz, K, Klp	CD
Direct Blue 2B	SS	CD
Direct Blue 3B	Jy	CD
Direct Blue 3BN	K	CD
Direct Blue 3BX	SS	CD
Direct Blue 5B	HS	CD
Direct Blue G, R	Mz	CD
Direct Blue R	Klp	CD
Direct Blue 2R, 3B, 2R	Jy, SS.	
Direct Blue Black 2B	By	CD
Direct Brilliant Blue BM	Mz	CD
Direct Brilliant Orange BO	L	CD
Direct Brilliant Orange M	Mhy	CD
Direct Brown BB	Bs	CD
Direct Brown BL	BL	CD
Direct Brown BS, GS, RS	Kell	CD
Direct Brown GG	By	CD
Direct Brown GX	Bs	CD
Direct Brown J	Klp	CD
Direct Brown M	SS	CD
Direct Brown N	L	CD
Direct Brown NX	Bs	CD
Direct Brown RD, 35	BL	CD
Direct Brown R, S	Kell	CD
Direct Brown RS	Kell	CD

Name of Dye.	Agent or Maker.	Dye Method.
Direct Brown SDP	SS	CD
Direct Brown TB	Mz	CD
Direct Brown TS, TSB	Klp	CD
Direct Brown VX	Bs	CD
Direct Brown 130, 131	HS	CD
Direct Brown 5002	SJW	CD
Direct Buffalo Brown R	Sch	CD
Direct Catechu Brown	NI	CD
Direct Cross Dye Black RH, RS, NM, AM	H	Sulphur
Direct Cross Dye Blue B, R	H	Sulphur
Direct Dark Green	Mz	CD
Direct Deep Black E, R, RW, T, E extra, RW extra	By	CD
Direct Deep Red P	At	CD
Direct Fast Brown B, GG	By	CD
Direct Fast Yellow B, BN	L	CD
Direct Garnet A	BL	CD
Direct Golden Yellow	BL	CD
Direct Gray	Jy	CD
Direct Gray B	Klp, SS	CD
Direct Gray J	SS	CD
Direct Gray N	AC	CD
Direct Gray R	SS, Klp	CD
Direct Gray reddish	Klp	CD
Direct Gray 4R	SS	CD
Direct Green, CP	Klp	CD
Direct Green B, No. 276	AC, SS	CD
Direct Green BX, S	BL	CD
Direct Green C, CB	Mz, Kell	CD
Direct Green CY	Kell	CD
Direct Green G	Jy	CD
Direct Green P, A	Klp	CD

Name of Dye.	Agent or Maker.	Dye Method.
Direct Green Y	Klp	CD
Direct Green YYC	Sch	CD
Direct Green 177, 228	HS	CD
Direct Indigo Blue A, BN	Klp	CD
Direct Indigo Blue RB	At	CD & CDv
Direct Indigo Blue BK	Klp	CD
Direct Lemon Yellow	Klp	CD
Direct Navy Blue C, SB	Sch	CD
Direct New Blue 4B	A	CD
Direct Olive Y	Sch	CD
Direct Orange	Fi.	
Direct Orange G	HS	CD
Direct Orange KR, KY	Kell	CD
Direct Orange OR, R	Kell	CD
Direct Orange R	SS	CD
Direct Orange 2R	K	CD
Direct Orange Y	SS	CD
Direct Orange 12, 69	HS	CD
Direct Oriol Yellow	Kell	CD
Direct Pink	Sch	CD
Direct Pink B	Jy	CD
Direct Pink G	S	CD
Direct Plum	Jy	CD
Direct Red	A, By, Fi, Kell	CD
Direct Red B	Bs	CD
Direct Red C, B	AC	CD
Direct Red E, T	Kell	CD
Direct Red 5SE	Kell	CD
Direct Red No. 55	HS	CD
Direct Red extra	Jy	CD
Direct Safranine B	By	CD
Direct Salmon	At	CD
Direct Scarlet B, conc.	K	CD

Name of Dye.	Agent or Maker.	Dye Method.
Direct Scarlet G	K	CD
Direct Scarlet R	K	CD
Direct Sulpho Black RH, RS	H	Sulphur
Direct Tan 5506	HS	CD
Direct Union Black	Jy.	
Direct Violet A, C	Sch	CD
Direct Violet R	Jy	CD
Direct Violet 6 R extra	SS	CD
Direct Yellow	A, Bi, Fi, K, SS	CD
Direct Yellow C	KSS	CD
Direct Yellow C, P	Klp	CD
Direct Yellow BSR, BLR	At	CD
Direct Yellow G	AC, K, SS	CD
Direct Yellow 2G, 3G	K	CD
Direct Yellow NW	3L	CD
Direct Yellow R	AC, By	CD
Direct Yellow R extra	By	CD
Direct Yellow S	Sch	CD
Direct Yellow T	Klp	CD
Direct Yellow 443	FGB	CD
Direct Yellow 9673	Jy	CD
Discharge Black AF	Mz	WGS, SS
Disulphine Blue G	H	WGS
Domingo Alizarine Black, BG, RB	L	WGSCh
Domingo Alizarine Blue G, R	L	WGSCh
Domingo Alizarine Brown B, G, L	L	WGSCh
Domingo Black LK	L	WGS
Domingo Blue Black R, B	L	WGS
Domingo Blue P, N, BB	L	WGS
Domingo Chrome Black MFF, O, OO	L	Special
Domingo Chrome Brown	L	WACh
Domingo Chrome Red G	L	Special
Domingo Chrome Yellow G	L	Special

Name of Dye.	Agent or Maker.	Dye Method.
Domingo Green 3G, H	L	WCh
Domingo Seal Brown	L	WACh
Dominion Yellow O	At	CD
Double Brilliant Scarlet G, 2B, BR	A	WGS
Double Brilliant Scarlet 3 R	By	WGS
Double Green S, F	K.	
Double Ponceau 2R, 3R, 4R	By	WGS
Double Scarlet	K	WGS
Double Scarlet extra S	A	WGS
Double Scarlet G	tM	WGS
Double Scarlet R	Lev	WGS
Double Scarlet 2R	tM	WGS
Durophenine Brown V	Cl Co	CD
Eboli Blue	LBs	WG, CD
Eboli Blue B, 6R	L	CD
Eboli Green B, G	L, Klp	CD
Eboli Sky Blue, 3B, 5B	L	CD
Ebony Black	Klp	CD
Ecarlate B	SS	CD
Ecarlate J, JJ, V	RF	WGS
Ecarlate Brilliante	RF	CD
Ecarlate Croceine 3B	Mo.	
Echurine	LM.	
Eclipse Black B, H	Kell	Sulphur
Eclipse Blue B, R	Kell	Sulphur
Eclipse Bronze	Kell	Sulphur
Eclipse Brown 3G, V	Kell	Sulphur
Eclipse Corinth G	Kell	Sulphur
Eclipse Dark Brown	Kell	Sulphur
Eclipse Green GP	Kell	Sulphur
Eclipse Olive	Kell	Sulphur
Eclipse Phosphine GG, R	Kell	Sulphur
Eclipse Yellow G, 3G	Kell	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Elgene Base B	A	CD
Elgene Blue	A	CT
Emerald Green Crystals	PK, Bt, By	WG, SA, CT
Emin Red	A	WGS
Empire Black B, G	At	WACh
Empire Orange G	Bch.	
English Yellow		WGS
Eosamine B	A	WGS
Eosine A	PK	WA, SA
Eosine A conc., 2A, AG, A6G	Mz	WA, SA
Eosine bluish	Kell	WA, SA
Eosine B	Klp	WA, SA
Eosine BB	Klp	WA, SA
Eosine 3B	Mz	WA, SA
Eosine 10B, BF	Math	WA, SA
Eosine BN	Math, PK	WA, SA
Eosine DH, DHV	Klp	WA, SA
Eosine extra, extra yellow, extra conc., extra BB, AG, A3G, A5G, D	Mz	WA, SA
Eosine Bluish, extra yellow, yellowish	Kell	WA, SA
Eosine G	Math	WA, SA
Eosine GGB, GGF, GGG	Math	WA, SA
Eosine J	PK	WA, SA
Eosine 3J, 4J, extra	Mz	WA, SA
Eosine JJF	Math	WA, SA
Eosine S	PK	WA, SA
Eosine Y	Sch	WA, SA
Eosine 2110, 5765	Math	WA, SA
Eosine Scarlet B	Mz, Math	WA, SA
Eosine Scarlet BB extra	Mz, Kell	WA, SA
Eosine Yellowish	A, BrS, K	WA, SA
Erie Blacks	Sch	CD

Name of Dye.	Agent or Maker.	Dye Method.
Erie Green 235, DB, BT	Sch	CD
Erie Blue BX	Sch	CD
Erika B, BN, Bex	A	CD
Erika G, G ex	A	CD
Erika 3GN, 2GN	A	CD
Erio Blue BB, G, R, RR	Kell	WGS
Erio Carmine R	Kell	WGS
Erio Chrome Black A, B, BB, M, T	Kell	WACh
Erio Chrome Blue Black B	Kell	WACh
Erio Chrome Blue R	Kell	WACh
Erio Chrome Bordeaux B	Kell	WACh
Erio Chrome Brown B, G	Kell	WACh
Erio Chrome Olive G	Kell	WACh
Erio Chrome Violet B	Kell	WACh
Erio Chrome Yellow 6G	Kell	WACh
Erio Chrome Yellow G, 3G	Kell	WGSCh
Eriocyanine	Kell	WGS, SS
Erioglaucine	Kell	WGS, SS
Erio Rubine G, 2R	Kell	WGS
Erio Viridine B	Kell	WGS
Erythrine	PK	SA
Erythrine X	PK	WGS
Erythrosine	Br S, Klp, PK	WA
Erythrosine	Mz, PK	WA
Erythrosine, Bluish, Yellowish	Kell	WA
Erythrosine A conc. pure	Mz	Foods
Erythrosine AG	Mz	WA
Erythrosine B, BB	A	WA
Erythrosine blue shade	Mz	WA
Erythrosine BNT, D, DS	Math	WA
Erythrosine extra	Mz	WA
Erythrosine G	PK	WA
Erythrosine yellow shade	Mz, Math	WA

Name of Dye.	Agent or Maker.	Dye Method.
Erythrosine 694	Sch	WA
Ethyl Black 3B, T	B	WGS
Ethyl Blue B	B	WGS
Ethyl Blue BF	Mz	CT
Ethyl Blue BD, RD	Mz	Printing
Ethylene Blue, B, G, R, RR	B	SA
Ethyl Eosine	A, Bt	WGS, SS
Ethyl Green	PK	WGS
Ethyl Purple 6B	PK	Special
Euchrysine CG, R	B	Leather
Excelsior Lake Scarlet JN, 2JCN	Math	WGS
Excelsior Black	Math	WGS
Excelsior Black B, G, 5G	Sch	WGS
Fast Acid Black B, 3B	ADC	WGS
FastAcid Black 3B, R, T	Mz	WA
Fast Acid Blue B	By	WGS
Fast Acid Blue R, R conc.	Mz	WGS, SS
Fast Acid Eosine G, G extra	Mz	WGS
Fast Acid Fuchsine B	By	WGS
Fast Acid Green B, BN, BS, BZ	Math	WGS
Fast Acid Green BB, extra	Mz	WGS
Fast Acid Magenta G, G conc.	Mz	WGS
Fast Acid Phloxine A, A extra	Mz	WGS
Fast Acid Ponceau	Klp	WGS
Fast Acid Red A	Mz	WGS
Fast Acid Red B	Mz, PK	WGS
Fast Acid Red ER	L	WGS
Fast Acid Scarlet	Klp	WGS
Fast Acid Violet A2R	Mz	WGS, SS
Fast Acid Violet B, BE	Mz	WGS, SS
Fast Acid Violet 10B	By	WGS
Fast Acid Violet R, RBE, RGE	Mz	WGS, WCh
Fast Azo Garnet Base	Mz	Printing

Name of Dye.	Agent or Maker.	Dye Method.
Fast Azo Grenat	Mz	WGS
Fast Black B, BS	B	Sulphur
Fast Black D	Sch	CD
Fast Blue	Mz, Brs	WGS
Fast Blue B for wool	Mz, A, PK	WGS
Fast Blue for Cotton, B, 3B, 3R	Kell	CT
Fast Blue for Cotton, B, 2B, 3B, 4B, 5B, 6B	Mz	CT
Fast Blue for Cotton, B, B2, BR2	A	CT
Fast Blue for Cotton R, 2R, 3R, RB	Mz	CT
Fast Blue for Cotton, TAI, TAII, TAIII	Mz	CT
Fast Blue 2B for Cotton	A, NI, SS	CT
Fast Blue 5B greenish	Mz	WGS
Fast Blue B, BA, 3B, 6B, for wool	A	WGS
Fast Blue 6B for wool	A	WGS
Fast Blue BN	Math	WGS
Fast Blue BBH	L	CT
Fast Blue Black paste	Mz	CT
Fast Blue Black M paste	Mz	CT
Fast Blue C	Jy.	
Fast Blue D	Mz	WGS
Fast Blue EL	O.	
Fast Blue E, EOOO	O	WGS
Fast Blue extra greenish	Mz	WGS
Fast Blue FS	Mz	WGS
Fast Blue G	Bd, Bt	WGS
Fast Blue G extra	Mz	WGS
Fast Blue greenish	Mz, PK	WGS
Fast Blue 6G	Math	WGS
Fast Blue N	Sch	WGS
Fast Blue NG, NR	O	WGS
Fast Blue O, OO	Mz, Klp	WGS
Fast Blue OOO	O	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Fast Blue BRG for cotton	A	CT
Fast Blue 3R for cotton crystals	Mz	CT
Fast Blue R	Mz, A, Math, PK	WGS
Fast Blue R, RA for wool	A	WGS
Fast Blue 2R, 3R, 5R, No. 60	Mz	WGS
Fast Blue, RD, RRD	Math	WGS
Fast Blue III R	S	CT
Fast Bordeaux O	Mz	WCh
Fast Brown	Mz	WGS
Fast Brown 3B, G	A	WGS
Fast Brown N	PK	WGS
Fast Brown ONT yellowish	Mz	WGS, SS
Fast Brown R	Mz, Pk	CD
Fast Brown 25	A	WGS
Fast Chrome Black L, M	H	WACh
Fast Claret	HS, Klp	WGS
Fast Claret Red O	Mz	WGS, SS
Fast Cotton Blue B, 3B, R, RR, 3R	Mz	CT
Fast Cotton Brown R	Kell	CD
Fast Cotton Orange 6R extra	Bs	CD
Fast Cotton Yellow 10G	Mz	WG, SA, CT
Fast Dark Blue B	Mz	WGS
Fast Diamine Yellow ARR	Bs	CD
Fast Direct Blue	Mhy	CD
Fast Direct Blue G	Bt	CD
Fast Direct Brown BB, G	Bs	CD
Fast Fulling Blue RR	Bs	CD
Fast Gray B, R	Klp	WCh
Fast Green	O	CT
Fast Green No. 12 paste	Mz	WCh
Fast Green No. 16	Mz	WCh
Fast Green Crystals O	Mz	WCh
Fast Green extra, extra bluish	By	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Fast Green B, CR	By	WGS
Fast Green B	Math	WGS
Fast Green CR	Bs	WACh
Fast Green M, SS	By	WGS
Fast Indigo Blue R	Klp	Printing
Fast Light Green	K	WGS
Fast Light Orange G	By	WGS
Fast Light Yellow, G, 2G, 3G	By	WGS
Fast Milling Red G	Lev	WCh
Fast Mordant Blue B, R	Mz	WCh, WGSCh
Fast Mordant Yellow G	By	WGS
Fast Navy Blue A, G	PK	CT
Fast Navy Blue GM	O	CT
Fast Navy Blue M	K	WGS
Fast Navy Blue RA	K	CT
Fast Navy Blue RM	O	CT
Fast Navy Blue RN	K	CT
Fast Neutral Violet B	O	CT
Fast New Blue for Cotton	Math	CT
Fast Orange O	Mz	Lakes
Fast Pink B	At	WGS
Fast Pink for Silk	Klp	CD
Fast Ponceau B, 2B	Klp.	
Fast Red	Mz, CDC, A, Klp	WGS
Fast Red A	A, By, K, O, PK	WGS
Fast Red B	NI, PK	WGS
Fast Red BT	By, Klp	WGS
Fast Red C	PK	WGS
Fast Red D	O, PK	WGS
Fast Red E	By, PK	WGS
Fast Red E, B	PK, Bs	WGS, SS
Fast Red extra	Kell	WGS, SS
Fast Red 7B	NI.	

Name of Dye.	Agent or Maker.	Dye Method.
Fast Red NS	By	WGS, SS
Fast Red O	Mz	WGS
Fast Red R	AC	WGS
Fast Red RC	Sch	WGS
Fast Red RR, RY	PK	WGS
Fast Red S	Mz	WGS, SS
Fast Scarlet, B	K	WGS
Fast Silk Gray O	Mz	SS
Fast Sulphon Violet 4R, 5BS	S	WGS
Fast Violet	Klp	WCh
Fast Violet B	Mz	WCh
Fast Violet bluish, reddish	By	WGS
Fast Wool Blue A	A	WGS
Fast Wool Blue RL	By	WGS
Fast Yellow	BrS, By, Math, PK,	WGS
Fast Yellow G	Th	CD
Fast Yellow greenish	Bs	WGS
Fast Yellow M	BL	WGS
Fast Yellow R	K	WGS
Fast Yellow S	Mz, Math	WGS
Fast Yellow 4S	SS	WGS
Fast Yellow TS	Mz	CD
Fast Yellow, 1, 2	Sch	CD
Fast Yellow 272	Sch	WGS
Fat Ponceau	Mz.	
Filling Blue	Klp	WCh
Fine New Green Crystals	Bt.	
Fine Violet	Bt.	
Firn Blue	Klp	WGS, SS, CT
Flavanthrene G, R	B	Printing
Flavazine S, L, T, RL	Mz	WGS
Flavazol	A	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Flavinduline	PK	CT
Flavophosphine, G conc., new, 2G conc., new, 4G conc., new, R conc., new	Mz	CT
Flavophosphine, GO new, 2GO new, 4GO new, RPO new, GCO new	Mz	Leather
Florida Red, B, G, R	L	WGS
Fluoresceine	Mz, Klp, Math, PK	...
Fluoresceine G, R, 6836	Math	WGS, SS
Fluorescent Blue	Klp, SS.	
Formyl Blue B	Math	WGS
Formyl Violet 4B, 6B, 8B, 10B, S4B, S5B	Math	WGS
Fram Blue G	By	WGS
Fuchsine	Mz, P, By, Klp, Math, O, PK, NI, PS	WG, SS, CT
Fuchsine A	SS	WG, SS
Fuchsine Crystals 685	Sch	WG, CT
Fuchsine FCOOB	Math	WG, SS
Fuchsine S	Mz	WGS, SS, CT
Full Blue O	Klp	WCh
Fulling Black	K	WCh
Fulling Blue	Kell	WGS
Fulling Blue G, R	Mz, Bs	WGS
Fulling Blue JB	Mz	CDv
Fulling Brown JB, JR	Mz	CDv
Fulling Green	At	
Fulling Green JB, JG	Mz	CDv
Fulling Green	Mz, At	WGS
Fulling Red B	Math	WGS
Fulling Red B, FGG, FR, G	Bs.	
Fulling Red JB	Mz	CDv
Fulling Red R	Bs	WCh

Name of Dye.	Agent or Maker.	Dye Method
Fulling Yellow	Mz	CDr
Fulling Yellow JG, JR	Mz	WGS
Fulling Yellow O	Math	WGS
Fulling Yellow OO	By, Kell	WCh
Fuscanthrene B paste	PK	Vat
Gallamine Blue	Kell	WCh
Gallanil Green	Klp	WCh
Gallanil Indigo P, PS	Klp	WCh
Gallanil Violet	Klp	WCh
Gallazin A	DH	WCh
Gallein A paste, R paste, W powder	Mz, By, PK	WCh
Gallein paste	Mz	WCh
Gallocyanine BS, DH	Mz, By, PK	WCh
Gallocyanine paste	H.	
Gallocyanine paste D	A, K	WCh
Gambine	H	WCh
Gambine B, G, R, Y, YDS, Yellow	H	WCh
Garnet	HS	WGS
Garnet 71031	AC	WCh
Geneva Blue, C, RR	AC	WCh
Geneva Brown	A.	
Gentian Blue 6R	Kell	CT
Gentianin	Kell	WGS, CT
Geranium GN	By	WN, CT
Geranine BB, G	Mz, By	CD
Germania Red	Klp	CT
Giroflé	DH	CT
Glacier Blue	Klp	WGS, SS, CT
Glaucol G	L	WGS
Gloria Black B	Math	WSA
Glycine Blue, Corinth, Red	Ki	CD
Golden Brown	BL	CD
Golden Yellow	H	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Gold Orange	Bs, By	WGS, CT
Gold Orange for Cotton	Klp.	
Gold S, C	Sch	CD
Gold Yellow	By	WGS, SS
Gold 83	Gt	CD
Gray B, R	Klp.	
Green resinate A	Math.	
Grenadine	Mz, Nl	WG, SA, CT
Grenadine B, BB, G	O.	
Grenat S	PK.	
Guernsey Blue	Mz, O.	
Guinea Bordeaux B	A	WGS
Guinea Carmine B	A	WGS
Guinea Fast Green B, O	A	WGS
Guinea Fast Violet 10B	A	WGS
Guinea Green B, G, B extra	A	WGS
Guinea Red 4R	A	WGS
Guinea Violet 4B	A	WGS
Half Wool Black B, T	O	CWD
Half Wool Black BN, 2BN, 4BN, 2BNI	B	CWD
Half Wool Black LS	By	CWD
Half Wool Black S	Math	CWD
Half Wool Blue B, BD	Mz	CWD
Half Wool Blue G	Math	CWD
Half Wool Black S, 2B, 3B	Math	CWD
Half Wool Black W	Mz	CWD
Hat Black FC, MC	Math	WGS
Havanna RF VB	Math	CT
Havanna Black TED	AC	CD
Havanna Blue DR, W	AC	CD
Havanna Brown CBB, O, No. 50, No. 61, B, YY	AC	CD
Helianthine	Kell, PK	WGS, SS

Name of Dye.	Agent or Maker.	Dye Method.
Heligoland Blue B, G, GA, GG, R, 2R	Jy	CD
Heligoland Brown	NI	CD
Heligoland Red	NI	CD
Heligoland Yellow	NI	CD
Helio Fast Blue BL	By	Lakes
Helio-Orange GL, RL	By	Lakes
Helio Purpurine 4BL, 7BL, GL	By	Lakes
Heliotrope	Mz, A, By	CD
Heliotrope Tannin	Math	CT
Heliotrope B	Mz, A, By, K	CD
Heliotrope 2B	Mz, A, By, K	CD
Helvetia Blue	Kell	WGS, CT
Hessian Acid Red L	L	CD
Helvetia Green	Bs.	
Hessian Bordeaux	Mz	CD
Hessian Brilliant Purple	Mz, A, By	CD
Hessian Brown, BB, MM	Bs	CD
Hessian Orange	L	CD
Hessian Purple, B, D, N	Mz, A, By	CD
Hessian Violet	Mz, A, By	CD
Hessian Yellow	Mz, A, By	CD
Hoechst New Blue	Mz	WGS
Hofmann's Violet	KB	WG, SS, CT
Hofmann's Violet N	SS	CT
Homophosphine G	L	CT
Hydrazine Yellow O, L	O	WGS
Hydroleine Induline, Marine R, Primul.	RE	
Immedial Black FF extra, G extra, NV extra, NB, NG, 2 extra, BF conc., NBB, NN conc., NNR, NNG, NLN conc.	Math	Sulphur
Immedial Blue	Math	Sulphur
Immedial Blue C	Math	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Immedial Bordeaux G conc.	Math	Sulphur
Immedial Brilliant Black B, 5BV conc., 6B conc.	Math	Sulphur
Immedial Bronze S	Math	Sulphur
Immedial Brown B, 2R, BR	Math	Sulphur
Immedial Catechu, BG, BGG	Math	Sulphur
Immedial Dark Brown A, D conc.	Math	Sulphur
Immedial Dark Green B, G	Math	Sulphur
Immedial Direct Blue B, OD, JB	Math	Sulphur
Immedial Green BB ex, GG ex	Math	Sulphur
Immedial Indone R, RB conc., RG conc., BN conc., RR conc., BF conc., 2BF conc.	Math	Sulphur
Immedial Indogene GGL conc.	Math	Sulphur
Immedial Maroon B conc.	Math	Sulphur
Immedial New Blue G conc.	Math	Sulphur
Immedial Olive B	Math	Sulphur
Immedial Orange C	Math	Sulphur
Immedial Prune S	Math	Sulphur
Immedial Sky Blue	Math	Sulphur
Immedial Yellow D, GG	Math	Sulphur
Immedial Yelow Olive G	Math	Sulphur
Imperial Black	At	WGS
Imperial Green Crystals	Bt.	
Imperial Scarlet	By	WGS
Imperial Violet Crystals	At	WGS
Indalizarine	DH	WCh
Indamine Blue N, NB, N extra R	Mz	CT
Indamine Gray	NI.	
Indamine 3R, 6R, TD	NI	CT
Indathrene, C, S, X, CD, SC	B	Printing
Indazine, M, MT, P	Math	CT
Indazurine B, BB, GM, SGM, RM, TS	B C F.	CD

Name of Dye.	Agent or Maker.	Dye Method
Indian Yellow	By	WGS, SS
Indian Yellow G, R, FF	Math	WGS
Indigen Blue BB, R	Klp	CD
Indigene D, F	By.	
Indigo Blue N	Math	WG
Indigo Blue BNK	Klp	CD
Indigo Blue SGN	S S.	
Indigo Blue RB	Math	WGS
Indigo Extract, Synthetic MLB	Mz	WGS
Indigo MLB	Mz	Vat
Indigo MLBR	Mz	Vat
Indigo MLBRR	Mz	Vat
Indigo Powders 1006	H.	
Indigo Salt T	K	Printing
Indigo Substitute B, BS, pat	Mz	WGS, SS
Indigo Synthetic	B, M	Vat
Indigo Synthetic MLB, 20% paste, 100% powder	Mz	Vat
Indigotine A, B	Sch	WGS
Indigotine extra L, No. 150	Math	WGS
Indigotine extra L, and No. 1	Klp	WGS
Indigotine O, Synthetic MLB	Mz	WGS
Indigo Vat MLBI, 2, 3	Mz	Dyeing
Indocyanine B, BF, 2R, 2RF	A	WA
Indoin Blue BB	B	CT
Indo Blue 2B, 2R	By	CT
Indophenol White paste	Klp.	
Indophor	PK.	
Induline	Mz, Bs, By, Math, PK	
Induline B	K.	
Induline BE	SS.	
Induline 6B	A.	
Induline B, R powder	Mz	Printing

Name of Dye.	Agent or Maker.	Dye Method.
Induline NN, JS	PK.	
Induline 2N, 2N greenish, S V	Mz	WGS, SS
Induline R	K.	
Induline Red	SS	WGS
Induline Scarlet	PK	CT
Indumen Blue B	AC	WCh
Ingrain Black	H	CDv
Intense Blue	By	WGS
Iodine Eosine	Mo.	
Irisamine G	Math	CT
Iris Blue	PK.	
Iris Violet	PK.	
Isamine Blue B, GB, R	Math	CT
Iso Diphenyl Black B, BB, R	Kell	CD
Iso Rubin	A	WGS, SS, CT
Italian Green	ClCo	CD
Janus Black O. 1. 2. D	Mz	SA, CDv
Janus Blue B, R	Mz	SA, CDv
Janus Bordeaux B	Mz	CDv
Janus Brown B, R	Mz	SA, CDv
Janus Claret Red B	Mz	CDv
Janus Gray B, BB	Mz	SA, CDv
Janus Green B, G	Mz	SA, CDv
Janus Red B	Mz	SA, CDv
Janus Yellow G, R	Mz	SA, CDv
Jasmine	Kell	WGS, SS
Jet Black R	By	WG, WGS
Jute Black	Mz, Math, O	CT
Jute Black B, 3R	Grie	CT
Jute Black GN	Math	CT
Katigene Black Brown B ext conc., R ext conc.	By	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Katigene Black T, SW, 2B, TG, extra, SWR extra, TW extra, ST extra, WR extra, BF extra	By	Sulphur
Katigene Blue B	By	Sulphur
Katigene Blue Black B, 4B, R, NB ex.	By	Sulphur
Katigene Brilliant Black B, B ex	By	Sulphur
Katigene Brown 2R, 4B	By	Sulphur
Katigene Chrome Blue SG, 5G, 2R	By	Sulphur
Katigene Chrome Brown, 5G	By	Sulphur
Katigene Cutch B	By	Sulphur
Katigene Dark Blue R extra	By	Sulphur
Katigene Green 2 Bex, 4B, 2G	By	Sulphur
Katigene Indigo B, R ext, RL ext, CL. extra, G extra, 4RO extra	By	Sulphur
Katigene Khaki G, ext	By	Sulphur
Katigene Olive, G, GN	By	Sulphur
Katigene Red Brown R	By	Sulphur
Katigene Violet B	By	Sulphur
Katigene Yellow Brown R, GR, ext	By	Sulphur
Katigene Yellow G, greenish conc.	By	Sulphur
Kermesine Orange	Mz	WGS
Ketone Blue 4BN, G, R	Mz	WGS, SS
Ketone Green NN	Klp	WGS
Kiamensi Orange G, RR	At	CD
Kiton Blue	Klp	WGS
Kiton Green	Klp	WGS
Kiton Red S	Klp	WGS
Klondike Black 153	HS	CD
Klondike Black Brown	HS	CD
Klondike Blue 51, 71	HS	CD
Klondike Brown B, G, GG, No. 156	HS	CD
Klondike Olive Brown	HS	CD
Klondike Orange RR	HS	CD
Klondike Red	HS	CD

Name of Dye.	Agent or Maker.	Dye Method.
Klondike Yellow GG, 3G, No. 162	HS	CD
Kresotine Yellow G, R	A, By, O	CD
Kresol Red	PK.	
Kryogene Black B, BA, G	PK	Sulphur
Kryogene Blue R	PK	Sulphur
Kryogene Brown B, G	PK	Sulphur
Kryogene Direct Blue G	PK	Sulphur
Kryogene Olive	PK	Sulphur
Kryogene Yellow R, G	PK	Sulphur
Lake Red C	Mz	Lakes
Lake Scarlet FR, FRR, FRRR, GG, 2R, 3R	Math	WGS
Lake Scarlet, GRII, GRCL, RL, 2RL, 2RCL, 3RCL, 3291	Mz	WGS
Lanafuchsine SB, SG, 6B	Math	WGS
Lanaglaucine W	Mz	WCh
Laundry Blue B, 1, 2, 3	Math	WGS, SS, CT
Lazuline Blue	By	WGS
Leather Black New	Math.	
Leather Black C	Mz	Chrome
Leather Black T	Mz	Tannin
Leather Black TB, TG	Math	Tannin
Leather Brown	Mz, O	Tannin
Leather Yellow	Mz, Bs, Klp	Tannin
Leather Yellow G, GG	Mz	Tannin
Light Blue	SS, tM.	
Light Green	KB.	
Light Green SF, bluish, yellowish	PK	WGS, SS
Lithol Red, GG	PK	Lakes
London Blue, extra	Br S	WGS, CAl
Luzon Black	At	WGS
Lyons Black	FGB	WGS
Lyons Blue O, R, RR	Mz.	

Name of Dye.	Agent or Maker.	Dye Method.
Madison Blue V	At	C D & C Dv
Madras Blue B	At, FTM.	
Madras Blue G	SS	WGS
Madras Blue RR	At	WGS
Magdala Red	Mz, Klp	SA
Magenta	H, Math, Sch,	WG, SA, CT
Magenta Extra Large Crystals, extra yellow, Large Crystals, Small Crystals, Double Refined	Mz	WG, SA, CT
Magenta Large Crystals B	Math	WG, SA, CT
Magenta I	Klp	WG, SA, CT
Magenta Crystals 80408	RH	CT
Malachite Green	A, K, Klp, Math	WN, SA, CT
Malachite Green B	Mz, P, K	WN, SA, CT
Malachite Green BB, 4B	Mz	WN, SA, CT
Malachite Green Crystals	Mz	WN, SA, CT
Malachite Green G	P K	WN, SA, CT
Malachite Green Ia	Mz	WN, SA, CT
Malachite Green Superior	Mz	WN, SA, CT
Malachite Green No. 12	Mz	WN, SA, CT
Malachite Green Powder	Mz	WN, SA, CT
Malta Blue	SS	CT
Malta Gray, J	SS	CT
Malta Yellow AL	SS	CT
Manchester Brown, EE, PS	Math	CT
Manchester Yellow	Lev, RD	WGS
Manhattan Black BS	A C.	
Manila Brown, M15G	Sch	CD
Mandarine G extra, GR	A	WGS
Mandarine Orange G, extra	Mz	WGS
Marine Blue BI, 2RX, RI	Mz	WN, SA, CT

Name of Dye.	Agent or Maker.	Dye Method.
Marine Blue HH	L	WGS
Marinol Acid Blue R	H	WGS
Marion Red	Mz	Lakes
Maroon S	Mz, PK	WGS, SS
Mars Red G	PK	
Martial Black B	SS.	
Martius Yellow	Mz.	
Mauve	SS	SS
Mazarine Blue B, BG, RNS	AC	WCh
Mazarine Brown WO	AC	WCh
Mekon Yellow G, R	Klp	CD
Melanogen G, T	Mz	Sulphur
Melanogen Black G, T	Mz	Sulphur
Melanogen Blue B, BG	Mz	Sulphur
Melantherin JH	Klp	CD
Melanthrene B paste	B	Vat
Meldolas Blue	Math	CT
Melita Blue 6G	L	WGS
Melogen BH	S	CDv
Mercaptol Black	SS	Sulphur
Mercerine Scarlet 5B	H	WGS
Mercerine Wool Red 10B, G, Y	H	WA
Mercerol Blue B	H	WA
Mercerol Brown 3R	H	WA
Mercerol Green 3B	H	WA
Mercerol Wool Yellow R, G	H	WA
Meridian Green B	At	CD
Meridian Violet 51	At	CD
Meridian Yellow OOO	At	CD
Merino Blue, R	SS.	
Merino Brown	SS.	
Merino Yellow	SS.	
Metachrome Bordeaux	A	Special

Name of Dye.	Agent or Maker.	Dye Method.
Metachrome Brown B	A	Special
Metachrome Mordant	A	Special
Metachrome Orange R double	A	Special
Metachrome Yellow RD, 2RD, D	A	Special
Metamine Blue B, G	Klp	CT
Metanil Red 3B, 3B extra	By	WGS
Metanil Yellow	Mz, A, Bs, By, K, Kell O, Math, PK	WGS
Metaphenylene Blue B, BB	Math	WGS
Metaphenyl Yellow ME	SS	WGS
Methyl Alkali Blue	Mz, K, Keil, Klp, O, PK.	
Methyl Blue	Math, tM	SS, CT
Methyl Blue for Cotton	Mz. O	WGS, SS, CA
Methyl Blue for Silk	Mz, O	SS
Methyl Blue New	Kell.	
Methyl Blue GS	Math.	
Methyl Cotton Blue	Kell	CA
Methyl Diphenylamine Blue	Mz.	
Methylene Blue B	Mz. Kell, O, PK	WN, SA, CT
Methylene Blue B conc.	Mz	WN, SS, CT
Methylene Blue BB	Mz, Sch, A.	WN, SS, CT
Methylene Blue BB conc.	Mz, PK	WN, SS, CT
Methylene Blue BB crystals	CR	WN, SS, CT
Methylene Blue BB, extra	Mz	WN, SS, CT
Methylene Blue powder extra	A, PK	WN, SS, CT
Methylene Blue B, G, B, H	PK	WN, SS, CT
Methylene Blue crystal, chem. pure	Mz	WN, SS, CT
Methylene Blue D, DB, DBB extra, DBB conc., DBB extra conc.	Mz	WN, SS, CT
Methylene Blue D, pure	O	WN, SS, CT
Methylene Blue G	Math	WN, SS, CT
Methylene Blue 4BEE	SS	CT

Name of Dye.	Agent or Maker.	Dye Method.
Methylene Blue 4BEESL	SS	Printing
Methylene Blue RR	O	WN, SS, CT
Methylene Blue 3R, 5R, 6R, D3R, D5R	Mz	WN, SS, CT
Methylene Blue V	Kell	WN, SS, CT
Methylene Blue, Zinc free, pure	Mz	WN, SS, CT
Methylene Dark Blue 3BN, RBN, pat.	Mz	WN, SS, CT
Methylene Gray B, BF, G, ND, NF, O, R	Mz	WN, SS, CT
Methylene Green	Kell	WN, SS, CT
Methylene Green B	Mz, By	CT
Methylene Green G, GG, O, extra yellow, yellow conc.	Mz	WN, SS, CT
Methylene Heliotrope O	Mz	WN, SS, CT
Methylene Indigo O	Mz	WN, SS, CT
Methylene Violet	SS	WN, SS, CT
Methylene Violet BN, RRA, 3RAext.	Mz	WN, SS, CT
Methylene Yellow H	Mz	CT
Methyl Eosine	A, Klp	WN, SS, CT
Methyl Green	A, By, K, Math, SS.	
Methyl Indigo B, R	Mo	Vat
Methylindone B, R	Math	CT
Methyl Violet B, 2B	Mz, A, By, Math, NI, O, PK.	
Methyl Violet 2B, c. p., 2BN	Mz	WG SA, CT
Methyl Violet 2BC	Sch	WG, SA, CT
Methyl Violet BO	Math	WG, SA, CT
Methyl Violet 3B	Mz, Math, O.	
Methyl Violet 3BD	Math	WG, SA, CT
Methyl Violet 3BO	Bch.	
Methyl Violet 4B	Mz, Math, O	WG, SA, CT
Methyl Violet 4BO	Math	WG, SA, CT

Name of Dye.	Agent or Maker.	Dye Method.
Methyl Violet 5B	Mz, Math, O	WG, SA, CT
Methyl Violet 6B	Mz, Math, O	WG, SA, CT
Methyl Violet 6BO	Mz, K, Math, NI, O, SS	WG, SA, CT
Methyl Violet 6B, chem. pure	Mz	WG, SA, CT
Methyl Violet 6B, crystals	Kell, Klp, PK,	WG, SA, CT
Methyl Violet BSC	Math	WG, SA, CT
Methyl Violet extra	Mz	WG, SA, CT
Methyl Violet OB, OBB, O3B, O4B, O5B, O6B, O3R	O	WG, SA, CT
Methyl Violet R, 2R	Mz, Math	SW, WG, SA, CT
Methyl Violet 3R, 4R	Mz, Math	WG, SA, CT
Methyl Violet 5R	Mz	WG, SA, CT
Methyl Violet RO	Math	WG, SA, CT
Methyl Violet RSJ	Math	WG, SA, CT
Methyl Violet Superior	Mz	WG, SA, CT
Methyl Violet 72 O	Math	WG, SA, CT
Methyl Water Blue	PK	WG, SA, CT
Metol Blue	LBF	CD
Mikado Brown B, 3GA, MG	Mz, Bs	CD
Mikado Gold Yellow, 2G, 4G, 6G, 8G	Mz, Bs	CD
Mikado Orange G, R, 2R, 3R, 4R, 5R	Mz, Bs	CD
Mikado Yellow, 2G, 4G, 6G	Mz, Bs	CD
Milling Blue 2 Rex	Mz	WGS, WGSCh
Milling Blue 85	HS	WGS
Milling Green B	NYB	WGS
Milling Orange	D	WCh
Milling Red E	SS	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Milling Red FFG, FR, G, R	Math	WGS
Milling Red 82	HS	WGS
Milling Scarlet B		WGS
Milling Scarlet 4R conc., 4 RO	Mz	WA, WACh
Milling Yellow II, O, OO	Math	WGS
Milling Yellow 55	SS	WGS
Milling Yellow 84	HS	WGS
Milling Yellow R	L	WGSCh
Mimosa, YC	Kell	CD
Moline	At	WCh
Monochrome Blue B, 5R	Mz	Special
Monochrome Brown B	Mz	Special
Monochrome Gray G, B	Mz	Special
Monochrome Green AG	Mz	Special
Monochrome Orange	Mz	Special
Monochrome Red G, 5B	Mz	Special
Monochrome Violet	Mz	Special
Monochrome Yellow R. GG	Mz	Special
Montana Brown 3G, M	L	CD
Mordant Yellow G, 3R	PK	WCh
Mordant Yellow O, R	Mz	WCh
Muscarine	Klp	CT
Naccarat	SS	WGS
Nako Black O, OP, DB	Mz	Fur
Nako Brown D, P, PS, DD	Mz	Fur
Nako Red O	Mz	Fur
Nako Yellow O	Mz	Fur
Naphthalene Acid Black S	By	WGS
Naphthalene Black 2B, D	H	WGS
Naphthalene Blue B, 5G, DL	Mz	WGS
Naphthalene Green conc., V	Mz	WGS
Naphthaline Pink or Scarlet, see Magdala Red		

Name of Dye.	Agent or Maker.	Dye Method.
Naphthaline Yellow	Mz, Bs, Math	WGS
Naphthamine Blue 2B, 5B, BR, 2R, 3R	K	CD
Naphthamine Blue BE, GE	K	CDv
Naphthamine Brown 2B, 6B, R, N, 8B, RB	K	CD
Naphthamine Dark Blue R	K	CD
Naphthamine Direct Black FF	K	CD
Naphthamine Fast Black BE, GE, SE	K	CDv
Naphthamine Indigo Blue G, 2B, 5B, 2R, RE	K	CD
Naphthamine Pure Blue G	K	CD
Naphthamine Red H	K	CD
Naphthamine Yellow G	K	CD
Naphthazarine Black	B	WCh
Naphthazarine Blue	Bs	WGS
Naphthazarine Blue B	O	WGS
Naphthazarine Blue O	Bs	WGS
Naphthazarine R, S, B, BE, RE	O.	
Naphthine Brown	SS	WCh
Naphthion Red, see Orseille Substitute V		
Naphthine S	SS.	
Naphthoacetine Fast Black	Sch	WCh
Naphthocyanine	EP.	
Naphthogen Blue 2R, 4R	A	CDv
Naphthol S	Math.	
Naphtho Rubine	By	WGS
Naphthol Black B, BDF	Math	Printing
Naphthol Black BB, 3B, 4B, 6B, 12B	Math	WGS
Naphthol Black 4BA	H	WGS
Naphthol Black D	Mz	WGS
Naphthol Black P, NY, SG, 4R	Math	WGS
Naphthol Blue B, D	RE	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Naphthol Blue 2B	PK	WGS
Naphthol Blue G, R	Math	WGS
Naphthol Blue Black A	Math	WGS
Naphthol Brown 193	HS	WGS
Naphthol Green B, OO	Math	WGS
Naphthol Orange	A	WGS
Naphthol Red	SB	WGS
Naphthol Red C	Math	WGS
Naphthol Red O	Mz	WGS
Naphthol Red S, GR	PK	WGS
Naphthol Yellow	Klp	WGS
Naphthol Yellow S	Mz, By, Klp, Math, O PK	WGS
Naphthol Yellow SE	Mz	WGS, SS
Naphtalene Yellow	Math.	
Naphthylamine Black 4BK, 4BN, 6BN, 10B, ESN	By	WA
Naphthylamine Black 6BD	Math	WGS
Naphthylamine Blue Black B, 5B	C	WGS
Naphthylamine Brown	PK	WGS
Naphthylamine Pink	Klp	WGS
Naphthylamine Yellow	K	WGS
Naphthyl Blue	K	WGS
Naphthyl Blue 2B	PK	CD
Naphthyl Blue Black MNY, N, R, SB, S2B, S3B, FBB, FB	Math	WGS
Naphthyl Violet	K.	
Naphthylene Blue R, crystals	By.	
Naphthylene Red	By	CD
Narceine	Klp.	
Navy Blue B	A C, Klp	WGS
Navy Blue BW, H	Klp	WGS
Navy Blue Double conc., DR	O	CT

Name of Dye.	Agent or Maker.	Dye Method.
Navy Blue B, R	Mz	Printing
Navy Blue V	Mz	WGS, SS, CT
Neptune Blue BG, R	PK	WGS
Neptune Green S, SG	PK	WGS
Neptune Green 6O	HS	WGS
Nerol Black B, BB, 2G new, 4B, 2BG, 4BG	A	WA
Nerol Blue Black	A	WA
Nerogene D	A	Developer
Neutral Blue	Math	CT
Neutral Blue R, 3R	Mz	WN, WGS
Neutral Fast Violet B	Math.	
Neutral Gray G	A.	
Neutral Red extra	Math.	
Neutral Scarlet	Mz	CT
Neutral Violet extra	Math.	
Neutral Violet O	Mz	SA, WN
Neutral Wool Black B, G	Math	WN, WGS
New Acid Green GX, 3BX	By	WGS
New Acridine Orange G	Bs	CT
New Blue B, BF, D, 110, extra F, G, FL, L, O1114A, R, crystal, R powder, 72325	Math	CT
New Blue O	Mz	SS, WGS
New Blue R	Bs, By, Math.	
New Coccine	A, Klp.	
New Coccine O	Mz	WGS, SS
New Coccine R	A	WGS
New Cotton Solid Blue	Klp	CT
New Croceine	PK	CD
New Direct Blue B	A	CD
New Ethyl Blue, B, R, BS, RS	Mz	CT
New Fast Belgium Blue F	A C	WCh

Name of Dye.	Agent or Maker.	Dye Method.
New Fast Black	B L.	
New Fast Blue paste, F, H	By.	
New Fast Blue 3R crystals	Mz	CT
New Fast Gray	By	CT
New Fast Green 3B	Klp	CT
New Fast Yellow R	B	WGS
New Fuchsine	Klp	WGS, SS, CT
New Gray	By	WGS, CT
New Green	By	WGS, SS, CT
New Green O paste, powder	Mz	Printing
New Indigo	Klp	CD
New Magenta	O	WN, WG, SA, CT
New Magenta O	Mz	WN, WG, SA, CT
New Metamine Blue M	Mz	CT
New Methylene Blue BB, F, GG, N, NX, NF, R, 3R, 70721	Math	CT
New Methylene Blue N, NH	Mz	CT
New Methylene Blue F, FR	By	CT
New Methylene Gray B paste G powder	Mz	CT
New Patent Black B, E	K	WGAs
New Patent Blue B, 4B, GA	By	WGS
New Patent Silk Blue	By	SS
New Phosphine G	Math	CT
New Red L	K	WGS
New Solid Green BB, 3B	Klp	WGS, SS, CT
New Toluylene Blue B, GG, M, R	O	CD
New Toluylene Brown B, BB, BBO, P	O	CD
New Turmerine T	BrS	CD
New Victoria Black B	By.	
New Victoria Black Blue	By.	
New Victoria Blue B	By	WGS, CT
New Victoria Blue GG	Klp	CT
New Victoria Green	By.	

Name of Dye.	Agent or Maker.	Dye Method.
New Yellow	PK	WGS, CT
New Yellow L	K.	
Niagara Blue 6B	Sch	CD
Niagara Direct Black	Sch	CD
Niagara Union Black	Sch	CWD
Nicholson Blue	Br, S, Klp.	
Nicholson Blue B, 2B, 4B, R, 2R, 3R	Mz.	
Night Blue	Klp, PK	WGS
Nigramine	Nil	
Nigrogene Orange	PL	WGS
Nigrophor	B	Printing
Nigrosine, J	SS.	
Nigrosine alcohol soluble	Mz, A, Bs, Kell, Math, NI, SS.	
Nigrosine crystals, E, 73651	Math.	
Nigrosine water soluble	Mz, A, Bs, Klp, K, Kell, Math.	
Nigrosine water soluble No. 10, No. 12	Mz.	
Nigrosine Gray Blue, 1, 2, 3, 4	Mz	WN, SS
Nile Blue A, B, 2B, NN, R	PK	CT
Nitrazine Yellow	O.	
Nitrazol C	Math.	
Nitrophenine	ClCo	CD, WCh, SA
Nitrosamine Red	PK	CDv
Nitroso Base M 50%	Mz	Printing
Nitroso Blue MRS	Mz	Printing
Non Mordant Cotton Blue	Br. S.	
Nopaline	tM.	
Nyanza Black B	A, Mz	CD
Nubian Black	HS.	
Oenanthinine	Klp	WGS, SS
Oil Yellow A, B, D	Math.	

Name of Dye.	Agent or Maker.	Dye Method.
Oil Black, Blue, Brown, Green, Orange, Red, Violet	Mz	Math
Old Scarlet	By	WGS
Oleine	BL.	
Opal Blue	Mz, Br, S, Math.	
Opal Blue superfine, soluble	Mz	WGS, SS, CT
Opaline Black 1602	Bch	CD
Opaline 2G, 5G, R	Gb.	
Oramine Blue R	PK	CD
Orange	tM	WGS
Orange Crystals	NYB	WGS
Orange A	Mz, Klp, Math,	WGS, SS
Orange I	Mz, By, K, Klp, Math,	CDC, WGS, SS
Orange II	Mz, Klp, Math, SS,	WGS, SS
Orange III	Klp, Math, SS,	WGS, SS
Orange IV	Mz, Bs, Kell, Klp, PK, SS	WGS, SS
Orange ENL, ENZ, extra, 2G	Math	WGS
Orange G	Mz, A, Math, PK,	WGS
Orange GG	Bs, Math.	
Orange GG crystal	Math.	
Orange GRX	K	WGS
Orange GS	O	WGS
Orange GT, RO	By	WGS
Orange M	Klp	WGS
Orange MG paste	Klp	WGS
Orange MN	Klp	WGS
Orange N	K, Klp, PK	WGS
Orange P	O	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Orange R	Mz, Klp, Math, PK,	WGS
Orange RL, RRL, RN		
Orange RR	Math	WGS
Orange TA	Mz	WGS, SS
Orange Y	CDC	WGS
Orange 4	Mz, Math	WGS
Orange 4LL	Mz	WGS, SS
Orcelline		
Orchil Crimson powder	PK	WGS
Orchil Substitute G pat.	Mz	WGS
Oriol Yellow	Kell	CD
Oregon Black	AC	CD
Oregon Blue L, U	AC	WGS
Oregon Pink, Red, Yellow	AC	WGS
Orseille Red A	PK	WGS
Orseille Substitute G	A	WGS
Orseille Substitute N extra	Math	WGS
Orseille Substitute V	A, SS	WGS
Orseille Substitute 3VN	SS	WGS
Orseilline BB	By	WGS
Orseilline B, R	Mz	WGS, SS
Ortho Black 3B	A	WGS
Ortho Cerise B	A	WGS
Ortho Cyanine B, 6G, R	A	WGS
Oxamine Black, BR, MB, MD, MT	PK	CD
Oxamine Black BH	PK	CDv
Oxamine Blue B, BG, G, BB, BT	F, PK	CD
Oxamine Blue 4B, R	PK	CD
Oxamine Blue 3R, RX, 4R	PK	CD
Oxamine Blue Black BR	PK	CD
Oxamine Brown G, GR	PK	CD
Oxamine Copper Blue RR	PK	CD

Name of Dye.	Agent or Maker.	Dye Method.
Oxamine Dark Blue BR	PK	CD
Oxamine Dark Brown G, R	PK	CD
Oxamine Fast Bordeaux	PK	CD
Oxamine Fast Red F	PK	CD
Oxamine Green B	PK	CD
Oxamine Maroon	PK	CD
Oxamine Pure Blue A	PK	CD
Oxamine Red, B, MT	PK	CD
Oxamine Scarlet B	F.	
Oxamine Violet, BBR, GR, GRF, MT, RR	PK	CD
Oxblood 8851	Bs	CD
Oxy Chlorazol Blue	H	CD
Oxy Diamine Black A, AM, AT, B, BG, BM, BZ, BZS, CBS, D, N, NF, NR, S0000, NRT, R, RR, SA, S000, W, FFC extra, FFG, AFF, JE, JEI, JB, JW	Math	CD
Oxy Diamine Blue 3R, G, 3G, 5G	Math	CD
Oxy Diamine Brown RM, RO	Math	CD
Oxy Diamine Orange G, R	Math	CD
Oxy Diamine Violet B, G, R	Math	CD
Oxy Diamine Yellow GG	Math	CD
Oxy Diaminogen ED, EF, EN, EM, FF, FFG	Math	CDv
Oxydianil Yellow O	Mz	CD
Oxyphenine Gold	ClCo.	
Oxyphenine Gold G	HS	CD
Paeonine	Kell.	
Palatine Black 4B MM	PK	WGS
Palatine Chrome Black S	PK	WGSCh
Palatine Chrome Blue W2B, 2B	PK	WACh
Palatine Chrome Bordeaux	PK	WGSCh

Name of Dye.	Agent or Maker.	Dye Method.
Palatine Chrome Brown	PK	WGSCh
Palatine Chrome Claret	PK	WGSCh
Palatine Chrome Red R, B	PK	WGSCh
Palatine Chrome Violet	PK	WGSCh
Palatine Red	PK	WGS
Palatine Scarlet	PK	WGS
Paper Blues	Mz	
Paper Orange OO	Mz	Paper
Paper Scarlet bluish	PK.	
Paper Scarlet Blue and Yellow, 3B, 8086	Mz	Paper
Paper Yellow GGex, Rex	By	Paper
Paradiamine Black B, BB	Math	CD
Para Green G	By	CDv
Paramine Brown C, R	CR.	
Paramine Indigo Blue, Navy Blue	CR.	
Paraphenylene Blue R, Violet	Bs	CT
Paraphosphine G, R	Math	CT
Paratol Citron	Mz	Lakes
Paratol Chrome Yellow L	Mz	Lakes
Paratol Garnet 2R	Mz	Lakes
Paratol Maroon	Mz	Lakes
Paratol Orange	Mz	Lakes
Paratol Rose	Mz	Lakes
Paratol Red	Mz	Lakes
Paris Violet	SS	CT
Paris Violet 6B, 7B	RE	CT
Parma R paste	S	WCh, CT
Patent Blue A, AJI, B, G conc., J1, J2, N, L, J3, J0, J00, V, superfine, VG, WS, RL, 2RL	Mz	SS, WGS
Patent Dianil Black FF conc. FFA conc., FFC conc., FFT conc.	Mz	CD

Name of Dye.	Agent or Maker.	Dye Method.
Patent Green O, V	Mz	WGS
Patent Marine Blue LE	Mz	WGS
Patent Orange	A	WGS
Patent Phosphine	Klp	CD
Patent Rock Scarlet..	Br. S	CD
Pecora Black	Sch	CD
Pegu Brown G, DR	Bs	CD
Peri Wool Blue B, G	Math	WGS
Persian Yellow	Kell	WCh
Phenamine Blue B, G, R	PK	WGS
Phenedine Brown, Y, 2Y, 3 Y	SS	CD
Phenedine Brown By, 2By, 3By	SS	CD
Phenedine Orange J	SS	CD
Phenedine Pink JE	SS	CD
Phenedine Yellow 2A	SS	CD
Phenocyanine, B, D	Klp	Printing
Phenocyanine TB, TV, VS	Klp	WCh
Phenol Black SS	By.	
Phenol Blue Black 3B	By	WGS
Phenol Flavine	O.	
Phenylamine Black 4B, T	By	WA
Phenyl Blue Black N	By	WGS
Phenylene Black	SS	WGS
Phenylene Brown B R	O	CT
Phenylene Red B	SS	SA
Phenylene Violet B, R	SS	WGS
Philadelphia Yellow G	A	CT
Philochromine B, G paste	Mz	Printing
Phloxine	Mz, Kell, Klp, Math,	WA
Phloxine B, BB	Mz	WA
Phloxine 5B, BA extra, G O, GA ex.	Mz	WA
Phloxine P	P K	WA

Name of Dye.	Agent or Maker.	Dye Method.
Phloxine TA	Mo.	
Phloxine 749	Math.	
Phoenix Red A	Math.	
Phosphine	Mz, Br, S, Kell, Math, NI, PK, SS	Tannin
Phosphine 1A, 11A, extra	Math	Tannin
Phosphine Base L3G, LO, LOB	Mz	Printing
Phosphine N	K	Tannin
Phosphine P, LM, extra	Mz	Tannin
Pigment Brown	PK.	
Pigment Chlorine GG	Mz	Lakes
Pigment Chrome Yellow L	Mz	Lakes
Pigment Fast Yellow G, R	Mz	Lakes
Pigment Orange R	Mz	Lakes
Pigment Purpurine A	Mz	Lakes
Pigment Red B, R	Mz	Lakes
Pigment Scarlet 3B, G	Mz	Lakes
Pink B R	BL	CD
Pluto Black B, G, R, A, 3B, CR, L conc., TG extra conc., A extra, CF extra, F extra, BS extra, SS extra	By	CD
Pluto Brown R	By	CD
Pluto Milling Black B	By	CD
Pluto Orange G	By	CD
Polychromine B, A	Kell	CDv
Polyphenyl Black, B, G	Kell	WG, WGS
Polyphenyl Black GI, RI, T conc., TG conc., TM conc.	Kell	CD
Polyphenyl Orange R extra	Kell	CD
Ponceau B extra	Mz	WGS
Ponceau BO extra BO, BOG	A	WGS
Ponceau Brilliant 4R	Math	WGS
Ponceau G	Mz, Math	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Ponceau 2G	Mz, PK	WGS, SS
Ponceau 4GB	A	WGS, SS
Ponceau GR, GR2, GRCL	Mz	WGS, SS
Ponceau HP	By	WGS
Ponceau J, JJ	Math	WGS, SS
Ponceau R	Mz, A, PK, SS,	WGS, SS
Ponceau 2R, 3R, 2RCL, 3RCL	Mz	WGS, SS
Ponceau 2RS	SS	WGS, SS
Ponceau 3RB	A, PK	WGS, SS
Ponceau 4R	Mz, A, PK	WGS, SS
Ponceau 4RB	A	WGS, SS
Ponceau 5R	Mz	WGS, SS
Ponceau 6R, 6R crystal	Mz, PK	WGS, SS
Ponceau 6RB, 10RB, S extra, SS extra	A	WGS, SS
Ponceau YB	Mz	WGS, SS
Prague Alizarine Yellow G, R	Ki	WCh
Primrose	S.	
Primrose, alcohol and water soluble	Klp.	
Primula B, R	Mz	WG, SA, CT
Primuline	Mz, BrS, By, HS, K, Kell, Math, PK.	
Printing Black for Wool	PK	Printing
Printing Blue	A.	
Printing Blue B, H paste powder	R, Math.	
Printing Brown GR	B	Wool
Prune, powder	Mz	WCh
Prune pure	Mz, Math	WCh
Pure Blue	Mz, Klp, Math, PK.	
Pure Blue B S J	Klp	WGS, SS
Pure Blue O conc. double conc.	Mz	WGS, SS, CT
Pure Blue extra crystals	O	CT
Pure Blue V C	SS	SA

Name of Dye.	Agent or Maker.	Dye Method.
Pure Fast Yellow	Math.	
Pure Soluble Blue	Math.	
Purple Blue O	Mz	WGS, SS, CT
Purpuramine DH	DH	CD
Purpurine paste	BaCo, By, PK.	
Pyramine Orange, Y, 3G	PK	CD
Pyrogene Black BD, B, BN, G, GE, GN, FF	Klp	Sulphur
Pyrogene Blue 2R, RM12, R	Klp	Sulphur
Pyrogene Brown G, 5G, M, R, V, B, D, O, OR, ORR, 4R	Klp	Sulphur
Pyrogene Cutch 2G, R, DG, DR	Klp	Sulphur
Pyrogene Dark Green B, 3B	Klp	Sulphur
Pyrogene Direct Blue R, G	Klp	Sulphur
Pyrogene Gray B, G, R	Klp	Sulphur
Pyrogene Green B, FB, FF, 2G, 3G	Klp	Sulphur
Pyrogene Indigo	Klp	Sulphur
Pyrogene Olive N	Klp	Sulphur
Pyrogene Violet Brown SO, OR	Klp	Sulphur
Pyrogene Yellow M, 3R	Klp	Sulphur
Pyrol Black B conc. BB extra conc. G conc. X conc., ROO	L	Sulphur
Pyrol Blue Black	L	Sulphur
Pyrol Bronze	L	Sulphur
Pyrol Brown G	L	Sulphur
Pyronine B, G	Mz, Bs	WGS, SS, CT
Pyrosine, B, J	Mo	WGS
Pyrotine Orange	Bs	WGS
Pyrotine RRO	Bs	WGS
Quinoline Blue	G	Special
Quinoline Red	A	Special
Quinoline Yellow, Spirit	Mz, A	Special
Quinoline Yellow	Mz, A, By, PK, SS, WGS	

Name of Dye.	Agent or Maker.	Dye Method.
Red B	Math, PK	SW, CD
Red Blue crystals, powder	O	CT
Red C	PK.	
Red for Lake P	Mz	Lakes
Red 785	AC	WGS
Red Violet RS, 4RS, 5R extra, 5RS	PK	WGS, SS, CT
Red, Y, YB, YG, Y2G	Mz	WGS, SS
Regina Purple, Violet	BrS.	
Regina Violet, alcohol, water soluble	A	WGS, SS
Renol Brown M	tM	CD
Renol Claret Red	tM	WA
Renol Dark Green N extra	tM	CD
Renol Green B	tM	CD
Resinate Blue A	Math.	
Resinate Green A	Math.	
Resinate Red A	Math.	
Resinate Yellow A	Math.	
Resinate Violet A	Math.	
Resoflavine	B	WCh
Resorcine Blue	Mz	Printing
Resorcine Brown	A	WGS
Resorcine Yellow	A, K	WGS
Resorgyl Yellow	RF	CD
Rheonine A, GD	PK	CT
Rhine Blue BH	Jy	CD
Rhodamine B, B extra, 3B, G, G extra	Mz, Klp, PK	WA, SA
Rhodamine 3G, 5G	Klp, PK	WA, SA, CT
Rhodamine 6G, 5G	Klp, PK	WA, SA, CT
Rhodamine 6G, 6GD, 6G ext, 6GD ext.	Mz	WA, SA, CT
Rhodamine 5G, 4G	By	WA, SA, CT
Rhodamine extra B, O, R	Klp	WGS, SS
Rhodamine S	Klp, PK	WGS, SS
Rhodinduline Red B	By	WGS, SS

Name of Dye.	Agent or Maker.	Dye Method.
Rhodinduline Red G, S	By	WGS, SS
Rhodinduline Violet	By.	
Rhodinduline 2BR, Pink, RIV	HS	WGS
Rhodine 2G, 3G, 12GF	BCF	WA, SA, CT
Rhoduline Blue R, GG extra	By	CT
Rhoduline Orange N, NO	By	CT
Rhoduline Heliotrope	By	CT
Rhoduline Heliotrope 3B	By	CT
Rhoduline Pink 4B	By	CT
Rhoduline Pure Blue BB	By	CT
Rhoduline Yellow 6G	By	CT
Rocelline	Kell, Klp, Math, SS,	WGS, SS
Rocelline N	Mz	WGS, SS
Rock Scarlet YS	BrS.	
Rosanthrene A, B, CB, O. R, AW, GW, RW	Klp	CDv
Rosanthrene Bordeaux	Klp	CDv
Rosanthrene Pink	Klp	CDv
Rosanthrene Violet 5R	Klp	CDv
Rosazeine O extra B, B extra, 4G	Mz	WA, SA, CT
Rosazeine 6G, 6G ext, 6GD, 6GD ext	Mz	WA, SA, CT
Rosazine	SS	WGS
Rosafond	RH	CD
Rosazurine, B, BB, G	Mz, By	CD
Rose Bengale	Kell, Math, PK,	WA, SA
Rose Bengale AT	A, PK	WA, SA
Rose Bengale, B, 3B conc., G	Mz	WA, SA
Rose Bengale N	Math	WA, SA
Roseine	BrS.	
Roseline B, G, R	Mz.	
Rose Pink, bluish, yellowish	Klp	CT
Rose Rosanthrene	Klp	CDv

Name of Dye.	Agent or Maker.	Dye Method.
Rosinduline 2B Bluish, G, 2GB	K	WGS
Rosolane B, O, R, T paste	Mz	SA, CT
Rosolane	SS	WGS, SA
Rosophenine	ClCo	CD, WGS, SS
Rosophenine R, ink	ClCo	CD
Rosophenine 4B, 5B, 6B	ClCo	CD
Rosophenine Geranine	ClCo	CD
Roxamine	DH	WGS
Royal Green crystals	Klp.	
Royal Violet R	Mz	CT
Rubidine	KB.	
Rubin, S	A	SA, CT
Ruby small crystals	KB.	
Rubramine	NI	CT
Ruffigallol	PK	WCh
Russia Red B, G	Mz, Math	CT
Russian Leather Red	Math, O.	
Russian Red B, BB, G, GP, N	O.	
Sabol Brown, or palmetto extract	Nat.	
Safraniline	Kell	WGS, SS, CT
Safranine	Mz, Kell, Klp, Math.	
Safranine AG, AGT extra	K	SA, CT
Safranine AN extra	Mz, Math	SA, CT
Safranine ANF	Mz	SA, CT
Safranine B best	Kell	CT
Safranine B conc.	Mz	CT
Safranine BS	Math	SA, CT
Safranine conc.	Mz	SA, CT
Safranine FB extra	PK	SA, CT
Safranine FF extra No. 0	By	SA, CT
Safranine G	O.	
Safranine G extra	A, Math	SA, CT
Safranine GGF, GGP	Math	SA, CT

Name of Dye.	Agent or Maker.	Dye Method.
Safranine GGS	Mz, Math	SA, CT
Safranine M	O.	
Safranine MN, NY	PK	SA, CT
Safranine NT	Math	SA, CT
Safranine O	Mz, Math	SA, CT
Safranine PK	Math	SA, CT
Safranine Purple	PK	SA, CT
Safranine RS, Resinate	Math	SA, CT
Safranine superfine, bluish, yellowish	Kell	SA, CT
Safranine S 150	Math	SA, CT
Safranine T	Math	SA, CT
Safranine Y	BrS, Klp.	
Safrosine	PK	SA, CT
Salacine Black, D, P, PT	K	WGSCh
Salacine Blue B	K	WGSCh
Salacine Brown B, R, RC	K	WGSCh
Salacine Yellow, G, 2G, D	K	WGSCh
Salacine Red	K	CD
Salmon Red	A, NI, PK	CD
Scarlatol B	Mz	Lakes
Scarlet B	Math	
Scarlet B extra	Mz	WGS, SS
Scarlet Cardinal	PS	
Scarlet EC, FR, FRR, FRRR, for cotton	Math	CAl
Scarlet G, GG, GL, GR11, GV	Mz	WGS, SS
Scarlet BR	A	WGS, SS
Scarlet GRCL	Mz	WGS
Scarlet NR, NRR	SS	WGS, SS
Scarlet R	Mz, By	WGS, SS
Scarlet RBC	Mz, Math	WGS, SS
Scarlet RL	Mz	WGS, SS
Scarlet 2R	Mz, Klp	WGS, SS

Name of Dye.	Agent or Maker.	Dye Method.
Scarlet 2RCL, 3RCL	Mz	WGS
Scarlet RRL	Mz, Math	WGS, SS
Scarlet RVL	Mz	WGS, SS
Scarlet 3R, 3RL, 4R, 5R	Mz	WGS, SS
Scarlet 6R Crystals	Mz	WGS, SS
Scarlet S	Math	WGS, SS
Sea Blue	SS	WGS, CT
Seal Brown G	SS	CD
Serge Blue	O.	
Setocyanine	Kell	SS, CT
Setoglaucine	Kell	SS, CT
Setopaline	Kell	SS, CT
Sevres Blue	S	Printing
Silk Black A	H	SS
Silk Blue	Mz	SS
Silk Blue extra greenish, J8C, IC, T, 5BNOO, T5B, T3B, TB, TR, TRL	O	SS
Silk Gray O	Mz	SA
Silk Induline B	Mz	SS, CT
Silk Scarlet TB	H	SS
Silver Gray N	Math	
Sky Blue	JB	
Smaragd Green	By	
Solamine Blue B, R, FF	A	CD
Solar Black	AT	CD
Solid Blue	O	
Solid Blue BB, BD, BL, DD, RR	AT	CD
Solid Blue BD, BRD, 2BD, 3RD, 6G	Math	WGS
Solid Blue BL	At.	
Solid Blue R	Math	WGS
Solid Blue 3R	Math	WGS
Solid Brown O yellowish, L, NT	Mz	WGS, SS
Solid Green crystals, O, AI, 72780	Math.	

Name of Dye.	Agent or Maker.	Dye Method.
Solid Gray S	Math.	
Solid Green G	Klp.	
Solid Green J	SS.	
Solid Green JJ0, O	Klp	WGS SS, CT
Solid Green O paste	Mz	WCh
Solid Violet	Klp	WCh
Solid Yellow N	SS	WGS
Soluble Blue	Mz, Bs, BrS, Math	SS
Soluble Blue A1	O	CT
Soluble Blue B	Bch.	
Soluble Blue SB, 10B	BrS.	
Soluble Blue Cl, C3	Sch	CT
Soluble Blue, J, M, 00	O	CT
Soluble Blue R	Sch	CT
Soluble Blue BV, 3B	O	CT
Soluble Blue R	Mz.	
Soluble Blue 3R	Mz, O	CT
Soluble Blue SV	Mz.	
Soluble Blue XG, XL	BrS.	
Sorbin Red, G, BB	PK	WGS
Soudan Red I, II, III, G, R	A.	
Soudan Black 1, 2, 3, B, R, 2R	SS	WGS
Soudan Brown	A	CD
St. Denis Black B	SS	Sulphur
St. Denis Red	SS	CD
Stanley Red	ClCo	WGS, SS
Standard Blue, Brown, Cutch Shade, Fast Blue, Fast Brown, Red, Tan, Yellow, Red, Yellow	Me.	
Sterosine Gray	H.	
Stilbene Orange 4R	ClCo	CD, SS
Stilbene Red	A.	
Stilbene Yellow G, 3G, 6G, SG, 4G	ClCo	CD, SS

Name of Dye.	Agent or Maker.	Dye Method.
Substantive Pink CR	PK	CD
Sudan I, II, III	A, Jb	Special
Sudan G	A, Jb	Special
Sudan Brown	A, Jb	Special
Sulfamine Brown A, B, D 93	Bs	WCh
Sulfanilin Black B, G	K	Sulphur
Sulfanilin Brown P	K	Sulphur
Sulfogen S, MO	L	Sulphur
Sulphin	PK	CD
Sulpho Black	H	Sulphur
Sulpho Black G, R	By	WGS
Sulpho Cyanine G, 3R, 5R, GR	By	WGS, WCh
Sulpho Cyanine Black B, 2B	By	WGS
Sulpho Green	S	WGS
Sulpho Yellow S	K.	
Sulphogene Blue M	At	Sulphur
Sulphon Acid Blue B, R, 3R ext G	By	WGS
Sulphon Azurine D	Mz, By	WA, CD
Sulphon Orange G	By	WGS
Sulphon Yellow G, 5G, R	By	WGS
Sulphon Yellow 5G, R	By	WGS
Sulphur Black T, T extra, A	A	Sulphur
Sulphur Black AW extra, 2B ex, TB ex, 4B	A	Sulphur
Sulphur Black L, N, ST	Mz	Sulphur
Sulphur Blue L, extra	A	Sulphur
Sulphur Bronze	Mz	Sulphur
Sulphur Brown G, 2G	A	Sulphur
Sulphur Brown TBG, TBM	Mz	Sulphur
Sulphur Corinth B	Mz	Sulphur
Sulphur Cutch G, R	A	Sulphur
Sulphur Green G extra	A	Sulphur
Sulphur Indigo B	A	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Sulphur Yellow R ext	A	Sulphur
Sulphurol Black BT, GT	D	Sulphur
Sultan Violet	H	CD
Sun Yellow	Mz, A, By, Kell, Klp.	CD
Superfine Violet	KB	
Superior Violet	KB	
Superior New Green Crystals	KB	
Swiss Black B, BG, B2G, C, DG, D	SW	
Tabora Black R extra	Mz A	CD
Tannin Brown B	Math	CT
Tannin Heliotrope	Math	CT
Tannin Indigo	Klp.	
Tannin Orange R paste, powder	Math	CT
Tartrazine	Mz, Klp, PK	WGS
Tennyson Red	H.	
Terra Cotta	BL	WGS
Terra Cotta F, NF, NFG, X	Kell	CD
Terra Cotta R	Kell	WCh
Tetranil Brown R conc.	NYB	CD
Tetrazo Blue, 6B, 4R, RW, BX	NYB	CD
Tetrazo Brilliant Blue BB, RR, 6B	NYB	CD
Tetrazo Brilliant Green J, GDD	NYB	CD
Tetrazo Chlorine Scarlet B	NYB	CD
Tetrazo Cutch Brown	NYB	CD
Tetrazo Dark Brown	NYB	CD
Tetrazo Indigo Blue D	NYB	CD
Tetrazo Lemon Yellow	NYB	CD
Tetrazo Pink B	NYB	CD
Tetrazo Purpurine R	NYB	CD
Tetrazo Sulphur Black, extra, 2B ext, R extra	NYB	Sulphur
Tetrazo Sulphur Brown G, 3R	NYB	Sulphur
Tetrazo Sulphur Green D, 2Y, 3Y	NYB	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Tetrazo Sulphur Indigo B	NYB	Sulphur
Tetrazo Sulphur Yellow		
Tetrazo Yellow CH, R	NYB	CD
Thiamine Yellow	BrS.	
Thiazine Brown G, R	PK	CD
Thiazine Red G, R	PK	CD
Thiazol Yellow 3G, GL	By, A	SA, CT
Thio Brown 2B, R	Bs	CD
Thio Carmine R paste, powder	Math	WGS, SS
Thio Catechine S, 1, 2, 3, 4	SS	Sulphur
Thio Chromogene	Mz, Bs	CDv
Thio Cyanosine	Mo.	
Thio Flavine S	Math	CD
Thio Flavine T	Math	CT
Thiogen Black D	Grie	Sulphur
Thiogene Black NA, NB, T, BB conc., M conc., MR conc., 4B conc., 5B conc., MM conc., BR conc., MMR conc., MMG conc., M ext. conc., MM ext. conc.	Mz	Sulphur
Thiogene Black M liquid, BB liquid, BR liquid, B2R liquid	Mz	Sulphur
Thiogene Blue B, R, RR	Mz	Sulphur
Thiogene Bronze G	Mz	Sulphur
Thiogene Brown R, G, GG, GC, GR, GRR, S, RR	Mz	Sulphur
Thiogene Catechu R	Mz	Sulphur
Thiogene Coal Black O conc.	Mz	Sulphur
Thiogene Cyanine G, O	Mz	Sulphur
Thiogene Dark Blue B, BT, BTL	Mz	Sulphur
Thiogene Dark Red R, G	Mz	Sulphur
Thiogene Diamond Black B, V	Mz	Sulphur
Thiogene Gold Yellow A conc., AO	Mz	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Thiogene Green B, BL extra, GG, GL extra	Mz	Sulphur
Thiogene Heliotrope O	Mz	Sulphur
Thiogene Khaki O	Mz	Sulphur
Thiogene Navy Blue R	Mz	Sulphur
Thiogene Olive Green B, G	Mz	Sulphur
Thiogene Orange OG, R, RG, RR	Mz	Sulphur
Thiogene Padding Black M liquid	Mz	Sulphur
Thiogene Rubine O	Mz	Sulphur
Thiogene Violet V, B	Mz	Sulphur
Thiogene Yellow Brown OG	Mz	Sulphur
Thiogene Yellow G, GG	Mz	Sulphur
Thio Indigo Red B	K	Vat
Thio Indigo Scarlet R	K	Vat
Thion Black BE, TG	K	Sulphur
Thion Blue B, conc.	K	Sulphur
Thion Blue Black G	K	Sulphur
Thion Brown G, R, O, 3R	K	Sulphur
Thion Green B, 2G	K	Sulphur
Thion Violet Black	K	Sulphur
Thional Black T, TB, TR	S	Sulphur
Thional Bronze	S	Sulphur
Thional Bronze G	S	Sulphur
Thional Dark Brown M	S	Sulphur
Thional Green GG	S	Sulphur
Thional Yellow G, 3G	S	Sulphur
Thionol Black GTXAS, BC	Lev	Sulphur
Thionol Brilliant Green G extra	Lev	Sulphur
Thionol Brown 2R	Lev	Sulphur
Thionol Green B, 2B, 2G	Lev	Sulphur
Thionine Blue G0	Mz	WN, SA, CT
Thionine Blue 0, 00, 000	Mz	WN, SA, CT
Thio Orange G	Bs	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Thiophenol Black T extra, 2 B ex, 2 R ex, G ex, BF ex	Klp	Sulphur
Thio Phloxine	Mo.	
Thio Phosphine J	LP.	
Thio Ruby	Bs	WGS
Thio Vesuvine	Bs	WGS
Thioxine Brown R	O	Sulphur
Thio Yellow G, RM, R	Bs	CD
Thomas' Fast Black Nos. 44, 55	GP	SN
Thomas' Fast Egyptian Stain	GP	CD
Thomas' Fast Yellow 24	GP	CD
Titan Black ED	H	CD
Titan Blue B, BBB, S	H	CD
Titan Brown O, R	H	CD
Titan Como G, R, S	H	CD
Titan Gold, Gray, Navy Blue, Navy R, Orange N, Pink, Red, Red 6B, Scarlet C, Scarlet CB, Scarlet D, Scarlet S, Sky Blue, Yellow H, Yellow R, Yellow Y	H	CD
Tobacco Brown G, R	Math	CT
Tolan Red I, II, B	K	WGS
Tolamine Green, Violet	Klp	CD
Toledo Blue O	Bs	CD
Toluidine Blue O	A, O, PK	CT
Toluylene Black G	O	CD
Toluylene Blue B, R	O	CD
Toluylene Bordeaux B	O	CD
Toluylene Brown, G, R	O	CD
Toluylene Dark Blue B, R, GN	O	CD
Toluylene Orange R	Mz	CD
Toluylene Orange G, R, RR	O, A	CD
Toluylene Red or Neutral Red	O	CD

Name of Dye.	Agent or Maker.	Dye Method.
Toluylene Yellow, SG	O	CD
Toraline B, a logwood preparation.		
Triamine Black B, BT, MJ	Klp	CD
Triamine Blue BNW, MJ, MNW, TNW	Klp	CD
Trianisoline	Mo	CT
Trazol Black B	O	CD
Triazol Blue BB	O	CD
Triazol Blue BB, 3R, 4B	O	CD
Triazol Bordeaux B	O	CD
Triazol Brown E, N, A, B, G, GOO, SOOO	O	CD
Triazol Corinth B	O	CD
Triazol Dark Blue B, 3R, GW	O	CD
Triazol Indigo Blue	O	CD
Triazol Red 6B, 10B	O	CD
Triazol Violet R, B new, RR	O	CD
Trisulphon Blues	S	CD
Trisulphon Browns	S	CD
Trona Red 3B, 7B, 2G	By	CD
Tropaeoline D, G	Math	CD
Tropaeoline R, Y, RN, RNP	Math	WGS, SS
Tumerine 914	Math	WGS, SS
Turquoise Blue BB, G	By	CT
Tyemond Orange RY	H	WGS
Tyemond Scarlet SJ	H	WA
Tyemond Scarlet Y	H	WGS
Union Black B, BB, S, P, BG, A	Math	CWD
Union Black SM, BS	Mz	CWD
Union Black B, D, G	H	CWD
Union Black 2BNI	B	CWD
Union Blue DC, XX	Math	CWD
Union Blue R	A	CWD
Union Blue RH	H	CWD

Name of Dye.	Agent or Maker.	Dye Method.
Union Green	Sch	CWD
Union Navy Blue	Sch	CWD
Union Royal Blue 2G, RX	H	CWD
Urania Blue, B	Bs	WGS, SS
Uranine	Mz, A, BrS, Math, PK.	
Ursol D, P	Z, A	Fur
Vacanceine Blue, Scarlet	H.	
Vat Red paste, powder	H	CD
Vesuvine B, BB, 3BM, conc., 4GB conc., extra yellow, O, RV, 2RV, 3R, superior	Mz	WG, SS, CT
Vesuvine B	PK	WG, SS, CT
Victor Black	At	WGS
Victoria Black B, G, 5G	By	WGS
Victoria Black	Mz	Wool
Victoria Blue B	Mz, Kell, Klp, Math, PK	WG, SS, CT
Victoria Blue BS, alcohol soluble	Klp, PK	WG, SS, CT
Victoria Blue R, 4R	Kell, Klp, PK,	WGS, SS, CT
Victoria Green 3B	Klp, PK	WGS, SS, CT
Victoria Heavy Blue	By	WGS
Victoria Pure Blue	B	WGS
Victoria Rubine G, O	Mz	WGS, SS
Victoria Ruby	Mz	WGS, SS
Victoria Scarlet G, R, 2R, 3R, 4R, 5R, 6R	Mz	WGS, SS
Victoria Violet B, paste	Mz, PK	WCh
Victoria Violet 4BS	Mz, By	WGS
Victoria Violet 8BS, 4BSL	Mz	WGS, SS
Victoria Yellow, A, O	Mz	WGS
Victoria Yellow, conc.	Mz	WGS
Vidal Black S, D	SS	Sulphur

Name of Dye.	Agent or Maker.	Dye Method.
Vidaline Blue, BB, 5B, R, RR	SS	Sulphur
Vidaline Brown B, GG	SS	Sulphur
Vidaline Green	SS	Sulphur
Vigoureux Black I	Mz	Printing
Vigoureux Black S	Math	Printing
Vigoureux Brown B, N, SW, V	Math	Printing
Vigoureux Brown I	Mz	Printing
Vigoureux Gray I	Mz	Printing
Vigoureux Green B	Math	Printing
Vigoureux Red A	Math	Printing
Vigoureux Red I	Mz	Printing
Vigoureux Yellow I	Mz	Printing
Vilal Black	HSV	Sulphur
Violamine B, 3B, G, R, A2R, BE, RGE, RBE	Mz	WGS, SS
Violanthrene B, BS, CD paste	B	Vat
Violet APF	SS.	
Violet 5B, 6B	By	CT
Violet R, RR	Mo.	
Violet 7B	KB.	
Violet 0B	AC	WGS
Violet Black	PK.	
Violet 5R	By	WGS, SS, CT
Violet Blue AP	SS	WGS, SS, CT
Violet C	SS	WGS, SS, CT
Violet 4RN	Klp	WGS, SS, CT
Violet 3S0N	SS	WGS, SS, CT
Violet Resinate A	Math.	
Violet 118	HS	WGS
Viridanthrene	B	Vat
Vulcan Brown D, G	Klp	Sulphur
Walnut Brown A, B	Math	CT

Name of Dye.	Agent or Maker.	Dye Method.
Water Blue	Mz, By, Kell, Klp, Math, O, PK, Sch.	
Water Blue B	Math	SS, CT
Water Blue 3BA, 2BM, BNW	A	SS, CAL
Water Blue 6 B extra	O	CD
Water Blue BS, R, RB	Math	SS, CT
Water Blue R, RC, 2R, ADR, 4RW, 5RW	A	SS, WGS, CAL
Water Blue L	A	SS, WGS, CAL
Water Blue 00	K	SS, CT
Water Rose B	Klp	WGS, SA
Water Soluble Eosine	Klp	WGS, SS
Wood Violet S	PK	WGS
Wool Black	A, PK	WGS
Wool Black B	A, Bs	WGS
Wool Black 4B	A, ACW	WGS
Wool Black 4BF	A	WGS
Wool Black 6B	A, BS	WGS
Wool Black 6BW	A	WGS
Wool Black DG, DN	K	WGS
Wool Black GR	A	WGS
Wool Black WC	At	WGS
Wool Blue AF	Fi	WGS
Wool Blue B, 2B, R, 5B	A	WGS
Wool Blue FS	Mz	WN
Wool Blue K	PK	WGS
Wool Blue N, R extra, 5 R, B ex S R ex.	By	WGS
Wool Blue S	PK	WGS
Wool Blue SS	Kell	WGS
Wool Fast Blue BL, GL	By	WA
Wool Gray	Bs	WGS
Wool Gray, B, B double G, R	Klp	WGS
Wool Green B, BS	By, Klp	WGS

Name of Dye.	Agent or Maker.	Dye Method.
Wool Green S	Klp, PK	WGS
Wool Green SS	Kell	WGS
Wool Induline B	K.	
Wool Jet Black 2B, 3B	A	WGS
Wool Printing Black B	L	Printing
Wool Printing Black NB	Mz. Printing	
Wool Red B	Math	WGS
Wool Red extra	K	WGSS
Wool Red R, G	PK	WGS
Wool Scarlet 3R	CDC	WGS
Wool Scarlet R, 4R, 37W	Sch	WGS
Wool Violet R	K	WA
Wool Yellow	PK	WGS
Xanthine	Mz, Klp	SS
XL Acid Eosine 3B, 5B	H	WGS
XL Blue	H	WGS
XL Navy Blue	H	WGS
XL Red	H	WGS
Xylene Blue BS, VS	S	WGS
Xylene Red B	S	WGS
Xylidine Orange 5572	Math.	
Xylidine Ponceau, see Ponceau 2R.		
Xylidine Red, see Ponceau, 2R.		
Yellow AT	Math	WGS
Yellow Coralline.		
Yellow Fast to Soap	SS.	
Yellow for Leather, O, 2a, 7, 11, G	Mz	Tannin
Yellow Resinate A	Math.	
Yellow T	Klp	WGS, SS
Yellow W	By	WGS, SS
Yellow W R	Klp	CD
Yellow 5183, 521	HS	WGS
Yellow II	Math.	

Name of Dye.	Agent or Maker.	Dye Method.
Yellow N	RH.	
Zambesi Black D	A	CD
Zambesi Black B, BR, D, F, FO	A	CDv
Zambesi Black 2G, NA, V	A	CDv
Zambesi Blue B, BX, R, BX	A	CD
Zambesi Brown G, 2G	A	CD
Zambesi Gray B	A	CD
Zambesi Indigo Blue R	A	CD
Zambesi Pure Blue 4B	A	CD

PART VII

Miscellaneous Notes

Miscellaneous Notes

SIR WILLIAM HENRY PERKIN, F.C.S.

1838-1907.

It was with profound regret and sorrow that the chemical and industrial world learned of the death of this scientist in July, 1907. Coming suddenly so soon after his visit to this country in commemoration of his original discovery, the loss was personally felt by all those who had the pleasure of meeting him and joining in the celebrations in his honor.

It will always be of great satisfaction to those who originated this jubilee of the coal-tar color industry, that they were enabled to have the honored discover with them on these occasions.

THE SERVICES RENDERED BY THE CHEMIST IN THE DEVELOPMENT OF THE COAL-TAR INDUSTRY.

In taking a broad view of this subject we may say that in giving an account of the services of the chemist in the industry, or better, industries originating in the utilization of the various products contained in the substance known as coal-tar, it is necessary to give a complete history of these industries. It is impossible to separate in any way the scientific and the commercial development, as they are so closely interwoven in the advance made in the manufacture of the various products, whether coloring matters, medicines, technical products, or raw

materials. The whole displays a system of evolution which we can appreciate more thoroughly than those in some other branches of science, as we have before us the visible results of each step forward in working out the possibilities of the application of trained scientific knowledge to the problem of these industries.

THE EARLY HISTORY OF COAL-TAR DYES.

Although in the first half of the nineteenth century several investigators in the examination of certain substances obtained in various ways, discovered aniline and nitro-benzene, and the fact that these substances yielded colored bodies under suitable conditions, was known, it was not until 1856 that the first of what are now commonly known as "aniline dyes" was discovered and manufactured commercially. This discovery was due to Sir William Henry Perkin, whom we had the pleasure of entertaining in 1906 in honor of the 50th anniversary of his discovery. It is with deep sorrow that we feel that science and industry can no longer have the benefit of his personality and knowledge.

Two years after the appearance of Perkin's mauve on the market, Hofmann discovered magenta or fuchsine, and the next year Verguin manufactured it commercially. Medlock and Nicholson introduced the arsenious acid process for its manufacture in 1860. In the same year Girard and Di Laire discovered that by phenylating rosaniline or magenta, a blue coloring matter was obtained, known as spirit blue—being only soluble in alcohol, and in 1862 Nicholson discovered that this spirit blue by the action of sulphuric acid would be sulphonated and made soluble in water. This introduced a new series of colors, known as soluble blues, water blues and alkali blues.

These dyestuffs all belong to the triphenylmethane group of colors, but in 1858, P. Griess discovered what is known as the diazo reaction, which opened the way to what now is the largest and most useful group of colors in practical use, known as "azo

colors." The first of these was introduced by Simpson, Maule & Nicholson in 1863, and called "aniline yellow." This was amido-azo-benzene, and the same firm introduced this same year the methylated and ethylated rosamlines discovered by Hofmann the year before.

In 1863 Lightfoot, in England, discovered the method of forming on the vegetable fibers what is known as "aniline black." This, although one of the most widely known coloring matters, has defied analysis until last year, when R. Willstaeter and C. Moore claimed to have discovered the constitution of this elusive body.

The dyestuff industry at this time was located principally in England, as the names of the new colors which appeared from time to time show, but owing to the advances of technical education in France and later in Germany, it soon passed to these countries.

SYNTHESIS OF ALIZARINE FROM ANTHRACENE.

In 1868 Graebe and Liebermann announced an invention that had a most marked effect on commerce. This was the synthesis of alizarine from the anthracene in coal-tar. The original source of this was madder-root, the product of almost all warm climates, and up to that time the most important of the natural red dyestuffs, the synthetic production of the pure coloring matter, reduced this trade to practically nothing and limited the profitable production to two or three countries, so that "madder-root" became largely a matter of name.

The synthesis of alizarine from anthracene led not only to immediate results in regard to the red dyestuff, but started researches for other possibilities in the production of dyestuffs from anthracene.

The effect of these efforts has been most marked. After the reds appeared, orange, blue, brown, directly derived from anthracene and alizarine. Then somewhat later R. E. Schmidt brought out the higher oxyanthraquinon products which had marked ad-

vantages over the older dyestuffs. Next appeared the dyestuffs found by the condensation of various amido bodies with anthraquinon and its derivatives, and the latest, within two or three years, vat dyeing anthracene dyestuffs. All of these, the result of patient, untiring work on the part of chemists in the employ of the several large German manufacturing establishments.

The first of the aniline colors, it was found, required in dyeing cotton a mordant of some kind, either the fiber had to be treated with tannin or alum, or other metallic salt had to be used in the dye-bath. This condition continued until 1884, when Boettiger patented Congo red, which dyed unmordanted cotton in a bath containing merely common salt. This was followed by others in rapid succession, and to-day these dyestuffs, often called the "tetrazo dyestuffs" are one of the largest groups of coloring matters known. To this class belong the colors which are developed on the fiber, the first being the primuline yellow introduced in 1887. This is the original of all the dyestuffs which are dyed and afterward developed on the fiber, a class in general use on account of the fastness of the resulting shades.

In 1873, Croissant and Bretonnier introduced a dyestuff which they obtained by heating organic substances, such as bran, sawdust, etc., with sodium sulphide, known commercially as "Cachou de Laval." This was used in dyeing on a limited scale, but the method of making attracted little research until 1890, when Turners in England, and 1893, when Raymond Vidal in France, brought out the first of what are known as sulphide or sulphur blacks. This opened up a new field, which was immediately entered by numerous investigators, and the results are shown in the sample cards of the various manufacturers.

The greatest recent development as a result of chemical research is the manufacture and sale of synthetic indigo. The original processes for the synthesis of indigotin from toluene were discovered by Dr. A. Baeyer, in 1880, but were not commercially profitable. The Farbwerke Hoechst and the Badische Anilin & Soda Fabrik had an agreement to work out the Baeyer

processes, and took up the investigation of a new process invented by Carl Heumann in 1890, using benzene and naphthalene as starting points.

Before the technical development of Heumann's method had been brought to a successful result, the Farbwerke Hoechst succeeded in perfecting a method for the commercial application of Baeyer's orthonitro-benzaldehyde process, and commenced the commercial manufacture of synthetic indigo by this process in 1896, and shortly afterward the Badische Anilin & Soda Fabrik, the manufacture of indigo by Heumann's procss. The "Societe Chenique des Usines du Rhone." in Lyons, France, having at the same time succeeded in producing orthonitro-benzaldehyde cheaply, began also to produce indigo on a commercial scale.

While the commercial manufacture of indigo was now fully established, the most promising method, that of its production from benzone as indicated by Heumann, was still impracticable, on account of the unsatisfactory yields. A German chemist, J. Pfluger, discovered that the addition of sodium amide increased the yield sufficiently to make this process of Heumann's the most satisfactory and successful method for the syntheticproduction of indigo, and it is this process that is now generally used.

SYNTHETIC VS. NATURAL INDIGO.

The cost of production of indigotin, or indigo, as it is commonly known, has decreased so rapidly that the natural indigo trade has suffered a severe decline, and the government of India has called into service a number of expert scientists for the purpose of investigating the present state of the industry and the possibility of improving the conditions caused by the competition of the synthetic product with the natural.

The synthetic product is now almost exlusively used by the large manufacturing countries of the world. The total consumption in the United States for the year being equivalent to 1,500,000 pounds of 100 per cent. indigotin.

ITS MANY BENEFITS TO HUMANITY.

While the manufacturers were developing the coal-tar dyestuff in the way shown, they were not idle in other lines, as the list of medicinal chemicals derived from coal-tar shows.

All this is undoubtedly due to the effect of the services rendered by the chemist, as the number of products and their improvement so constantly and consistently shown in their manufacture indicate a corresponding increase in the scientific and practical knowledge of the subject.

That this is recognized by the manufacturers is shown by the number of chemists employed; some of the larger works in Germany each having 200 and more on their staff.

The manufacturing establishments in the United States have begun to employ chemists more and more in their works. If this spirit is encouraged and the use of scientific knowledge increased, the manufacturing interests of the United States will at last take their proper position among the other nations of the world. —*Journal Soc. Chem. Industry.*

ARTIFICIAL COLORS.

Since the products of synthetic chemical processes have been under the ban of the government, it has been popular to be unsparing in condemnation of all these substances both in the public and technical press. The following which appeared in the *American Perfumer and Essential Oil Review* is the conclusion of an article treating the subject from the side of the practical synthetic chemist:

"I do not propose to go into the technical questions involved in the manufacture of the organic colors. Neither do I propose to take up your time by comparing the chemical structure of the substances. But rather, I ask your pardon for inflicting so much chemistry upon you. But I wanted to show you the connection of these substances with the vegetable kingdom, which these simple examples have been sufficient to do. I want you

to see how, starting with the benzene ring, all of these colors are built up in the chemical laboratory, as well as in Nature's laboratory. I should like to show you how the benzene ring is formed in nature, from several common constituents, and how, by further changes, are brought about the formation of the more elaborate products.

"In itself the subject is interesting enough to warrant my trouble and your time, because, before we should finish I should show you through the list of substances with which you are familiar, such as vanillin, which is a benzene derivative, is a phenol, like carbolic acid and thymol and carvacrol, and is produced in nature in the vanilla bean, as well as in the chemical laboratory from oil of cloves, or starting with benzene. I could take up oil of lemon and show you that citral is not the most important constituent of the flavor, for which we must go among the benzene derivatives before we shall reach the light. That citral, which is an important constituent of oil of lemon, condenses with acetone to form ionone, in the course of which the benzene ring is formed, and that I might go into the great field of odoriferous bodies used in perfumery, where Nature again and again produces the benzene ring, coupling various alcohols with it to form the wonderful bodies to which the odor of flowers is due. I might go into the vegetable kingdom, and find these very colors formed in Nature, and eaten by man, as, for example, the red cabbage, which contains a whole bunch of these very colors which are called a coal-tar colors.

"Possibly some who are here would like to go further into the chemistry of the subject. Leffman's translation of Weyl's monograph, is not too technical to comprehend, and any of the various chemical works will go to the bottom of the subject.

"The difficulty of this whole question lies in its simplicity, paradoxical as that may sound. The technical names of the colors which we use, such as dimethylamidoazobenzene, sound formidable, but are simple enough when you understand that all of them are composed of several words, like this long name for butter-

yellow, which contains five simple words, and are so combined to inform the chemist of the chemical constitution of the substance.

"Seriously, the so-called coal-tar colors which are made use of in foods have no physiological action whatever, in the true sense of the term. I mean by that, if you would take into your stomach any reasonable quantity of such colors, no physiological action would result, and this is positively true, and has been so proved by every observer who has investigated the subject. For demonstrations, see the work of Weyl, already alluded to, or the more elaborate treatise of Schultz-Julius, as translated by Green. Indeed, I know of no class of chemical compounds so free in their entirety from effect upon the human system, even though taken in a thousand times the quantity that is ever administered in a food; even water is not more harmless. It has been often charged that these colors contain large quantities of arsenic—which was true of certain colors when first made, and when they were never used in food products, but it is not true to-day. But if the color were composed principally of arsenic, the small quantity employed, about 1 part in 32,000 of food, could be so taken without noticeable physiological effect. Being without physiological action, and practically inert, we have no account of such physiological action to render. And, while I am speaking here of the colors, which *are* used in food, and not of the colors which are *not* used in, and while it is admitted that there are colors made, which are used as dyes which possess poisonous characteristics, I still desire to insist, that if the poisonous colors WERE used in foods—AND POISONOUS COLORS ARE NOT USED IN FOODS—that, nevertheless, the tinctorial power of these substances is so great that if the poisonous colors were used in food no harm whatever would result.

"We come now to the really important part of our subject.

"Why are artificial colors used in food products?

"To deceive the public, the Agricultural Chemist would reply.

"The food manufacturer would truthfully reply, 'to please the

public, and because the public demands that the food which is to be eaten shall be properly colored.'

"And now comes Pawlow, a justly celebrated Russian physician and physiological chemist, the greatest physiologist who has ever lived, and one of the greatest men of all time, whose work has proven that the entire operation of the digestive apparatus is set in operation solely and alone through the action of a special part of the nervous system which proceeds from the brain and supplies all the glands of digestion, and which nervous apparatus will only set the glands to secreting the digestive fluids when itself is acted upon by the senses of smelling, seeing and tasting—the gusatory apparatus, which is of the highest importance to life. Pawlow has proved more. He has proved that the digestive glands not only are important for the secretion of the digestive fluid, but that if the body is persistently robbed of the fluid from one of the glands, the animal will die. It, therefore, becomes very important to the continuance of life, to furnish the means to excite the gusatory apparatus to work, and to keep it at work, and those features which are provided along with the food, such as the color and the flavor of the food, are of even greater importance, so far as the benefits which we may derive from the food, than can be any questions of the relative quantities of proteid, fat, carbohydrates and mineral in the food—which we once thought were the only indices of food values. And so we have need for the flavors, and a lot of them, and for colors, and all of them which it is proper to put into food, and the reason for the existence of the extract manufacturer, and the confectioner as well, is to be found in this wonderful revelation of an elementary physiological fact, by this great man, Pawlow. Moreover, it is not to tickle the fancy, or to please the eye, *per se*, but to assist in the elaboration of a series of processes upon which life most certainly depends. Of Pawlow a reviewer wrote, in a medical publication, to the physicians of America, 'read Pawlow's Die Arbeit der Verauungsdrusen, and be proud that you are a physician.' So great is his honor and his renown that it becomes

an honor to belong to the same profession as this man whose voice we may never hear, whose face we may never see, but who has written upon the pages of time these things which will remain, a mark of his genius, while time shall stand."—*Theron C. Stearns, M.D.*

THE DISCOVERY OF THE DIAZO REACTION.

In a letter dated 1887 Griess writes: "Dr. B. W. Gerland, when working in the laboratory of Prof. Kolbe in Marburg, investigated the action of nitrous acid on amido-benzoic acid at Kolbe's request (Annalen, April, 1858). Thus the oxybenzoic acid was prepared, indicating a chemical change then considered of much importance. In like manner I investigated a means of converting picramic acid (amido-dinitrophenylic acid) into the oxydinitrophenylic acid $C_6H_2(NO_2)_2(OH)_2$, but I obtained instead of this latter a compound possessed of such striking and peculiar properties that I at once concluded it must belong to a completely new class of compounds. Analysis soon showed me that this peculiar compound had the composition $C_6H_2(NO)_2N_2O$. Naturally, I soon submitted many other amido compounds in like manner to the action of nitrous acid, and obtained thus in almost every case the corresponding diazo compound. But the circumstance to which I was indebted for my success in obtaining the diazo compounds was that of the treatment of the amido compounds with nitrous acid in the cold, whereby the immediate conversion of the diazo compounds into other products was prevented, whereas in the earlier experiments of Hunt and Gerland a higher temperature was always attained, and consequently no diazo compounds could exist. Having obtained these diazo compounds, I then tried their action on all possible substances, amongst which, of course, are the numerous class of amido compounds. I found that the diazo compounds combine directly with these, forming frequently brilliantly colored substances which dye directly animal fibres. The first coloring matter thus

prepared by me, which I obtained in the years 1861–1862, was the benene-azo-a-naphthylamine (Phil. Trans. 1864, Ut. III., 679). It was first prepared on the large scale, to the best of my recollection, in the years 1865–6, by Caro, who was then chemist in the works of Messrs. Roberts, Dale & Co., of Manchester. I first recommended the oxyazobenzene obtained by me as a dyestuff in Liebigs Annalen, 137 (1866), p. 88."

A letter was also shown, dated May 2, 1887, in which Griess claims the first discovery and introduction into commerce of the benzidine dyestuffs.

Dr. Cain pointed out that according to the generally accepted history the first azo dye was aminoazobenzene, which was manufactured in London in 1863 while Griess's first discovery appeared to be in 1864. As regards the benzidine colors, he always understood they were discovered by Boettiger in Berlin, and manufactured by the Berlin Aniline Co. in 1884.

Mr. Watson Smith said he had not only taken his account from Griess's autograph letters to himself, but also from the joint biographical sketch in the Beriche of 1891 (24, 1007–1070), by Von Hofmann, Emil Fischer, and Caro. Caro here shows conclusively that Griess preceded Boettiger as to the benzidine colors.

The chairman (Mr. R. J. Friswell) said that he might clear up the matter mentioned by Dr. Cain. Amidoazobenzene oxalte was undoubtedly the first dyestuff of this series brought into the market by Messrs. Simpson, Maule & Nicholson. It was discovered by Frederick Field by passing a stream of nitrous gas into an alcoholic solution of aniline. As the reaction was carried out at the ordinary temperature, and the aniline was impure, various tarry and phenolic substances were formed, but the mass was partly converted into aminoazobenzene which was separated, purified, and sold as oxalate, its constitution being quite unknown. Griess, who had previously isolated diazoamidibenzene (Annalen, 1862, 121, 258-, made an analysis of Field's compound and showed that it was isomeric with his own compound.—*Journal Soc. Dyers and Colorists.*

PART VIII

Index

Index

Index

Index